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AN ANALYSIS OF PATENT SYSTEM AND ANTITRUST LAW ISSUES IN OLED DISPLAY INDUSTRY: FOCUSING ON THE PATENT STRATEGY FOR SECURING TECHNOLOGIES AND MATERIALS

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ABSTRACT

MEYOUNG JU JOUNG

AN ANALYSIS OF PATENT SYSTEM AND ANTITRUST LAW ISSUES IN OLED DISPLAY INDUSTRY: FOCUSING ON THE PATENT STRATEGY FOR SECURING TECHNOLOGIES AND MATERIALS

This dissertation presents an analysis of patent system and antitrust law issues in OLED (Organic Light Emitting Diode) display industry focusing on the patent strategy for securing technologies and materials. Material patent holders of multinational companies have been struggled to maintain their competitive position since they have powerful incentives by securing their monopoly rights and extension of the market exclusively beyond the legitimate scope or the length of time initially granted by the patent within the current regulatory framework. The dominant firms wielding great market power in OLED industry have pursued a variety of strategic patenting including combination inventions and broadly claimed inventions, and as a result, their questionable patents have been challenged through patent invalidation trials brought by prospective infringers in Korea, Europe and Japan.

These strategic patenting, however, may block competitors’ exploitation of its own invention, and thus inhibit competitors’ entry into the market since competitors try to avoid infringing such patents, which results in the suppression of competition. As a result, these conducts adversely affect consumer’s welfare to enjoy high quality and cheap products by preventing free competition with material competitors and panel manufactures in OLED industry. Virtually, the dominant firms’ such conducts have triggered antitrust scrutiny as predatory innovation and patent misuse concerns.
The ultimate goal of this dissertation is to provide proposals for encouraging the entry of small firms that rely on patent system as underlying bases for their innovation, into OLED industry without anticompetitive coercions of dominant firms, and for improving competitive innovation, thereby enhancing publics’ welfare which is also the common goal of patent law and antitrust law. Only when patent system and antitrust policy lie in the appropriate balance, consumers and innovators can find benefits. To achieve this goal, this dissertation discusses: how to establish uniform and effective patent system including patent examination guidelines to differentiate true improved invention from predatory innovation; and how to discourage anticompetitive predatory innovation and patent disputes in OLED industry. This dissertation is the research on the new attempt of application of US Antitrust Law to predatory innovation found in OLED industry and reinforcement of antitrust regulatory influence on the patent system.
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CHAPTER ONE  INTRODUCTION

I. BACKGROUND AND MOTIVATION

This dissertation presents an analysis of patent system and antitrust law issues in OLED (Organic Light Emitting Diode)\(^1\) display industry focusing on the patent strategy for securing technologies and materials.

Big global manufacturers such as Samsung Display Co. Ltd. (SDC), Idemitsu Kosan, LG Display, Kodak, Universal Display Corporation (UDC), Merck, Duksan Hi-Metal, Dow Advanced Display Materials and Hodogaya have been fighting each other to maintain and improve their competitive position in OLED market following the expiration of fundamental OLED patents of UDC which possesses almost all of original phosphorescent OLED (PHOLED) material patents.\(^2\)

OLED material patent holders such as Idemitsu Kosan and UDC have powerful incentives to secure their monopoly rights and extend the market exclusively beyond the legitimate scope or the length of time initially granted by the patent within the “current regulatory framework.”\(^3\)

Idemitsu Kosan has taken the world’s largest market share as a leading company in OLED technologies, and has built powerful original patent portfolios. It has tried to extend and reinforce their material patent rights in technology development and businesses by

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\(^1\) An OLED (organic light-emitting diode) is a light-emitting diode which is composed of electroluminescent film layers of organic compounds, emitting light under an electric current. OLEDs are used for TV screens, computer monitors, mobile phones and PDAs. See Kamtekar, K. T., Monkman, A. P., Bryce, M. R., Recent Advances in White Organic Light-Emitting Materials and Devices (WOLEDs), 22 (5) ADVANCED MATERIALS, 572 (2010); See D’Andrade, B. W., Forrest, S. R., White Organic Light-Emitting Devices for Solid-State Lighting, 16 (18) ADVANCED MATERIALS, 1585 (2004).


pursuing a variety of strategic patenting. As a result, their vulnerable patents including combination inventions and broadly claimed inventions have been challenged through patent invalidation trials or Information submissions by third party during the prosecution of patents by prospective infringers or aggressive competitors in Korea, Europe and Japan.

As another original material patent holder, UDC has a strong intellectual property portfolio of fundamental PHOLED technologies and materials used for PHOLED displays and lighting devices, wielding great market power in OLED industry. Recently, three UDC PHOLED patents were invalidated in Japan in March 2011 on the grounds that the broadest claims of fundamental patents were not valid in the challenging actions brought by Semiconductor Energy Laboratory (SEL), and they are also being challenged in Korea (by Duksan Hi-Metal) and in Europe.

The combination inventions and broadly claimed inventions however, may block competitors’ exploitation of its own invention, so the blocking patents may inhibit competitors’ entry into the market as predatory innovation since competitors try to avoid infringing such patents, which shall prompt the suppression of competition.

---

4 Universal Display Corporation, supra note 2.  
6 The patents claimed too broad scope of compounds beyond the written description of specification.  
7 A Japanese company that specializes in R&D and intellectual property.  
8 OLED-info.com, UDC's key patent claims denied in Germany?, (Nov. 08, 2011), available at www.oled-info.com/udcs-key-patent-claims-denied-germany.  
9 A patent relating a particular area of technology which prevents another patent from being used because the other patent relies on technology covered by first. See John H. Barton, Antitrust Treatment of Oligopolies with Mutual Blocking Patent Portfolios, 69 ANTITRUST L.J. 851 (2002).  
These conducts exercising the monopolist’s power to secure and extend its monopoly right adversely affect consumer’s welfare to enjoy high quality and cheap products by preventing free competition with material competitors and panel manufactures in their relevant market.¹² Virtually, the dominant firms’ such strategies have drawn antitrust scrutiny¹³ and patent misuse¹⁴ concerns.

Patent law by itself, however, cannot appropriately regulate such anticompetitive conducts because it is not primarily “designed to police and punish patent holders: rather, it focuses primarily on policing and punishing infringers.”¹⁵ Moreover, “patent law does not provide causes of action to those injured by the misconduct of patentees,” so it cannot remedy detriments caused from the invalid patent for alleged infringers.¹⁶ Only when patent system and antitrust policy to work together against enforcing invalid patent rights, consumers and innovators can find benefits, because “effective antitrust enforcement” shall “reinforce the goals of the patent system” without interference of patent policy.¹⁷

II. RESEARCH PURPOSE AND CLAIMS

The ultimate goal of this dissertation is to provide proposals for encouraging the entry of small firms that rely on patent system as underlying bases for their innovation, into OLED

¹² See FED. TRADE COMM’N, supra note 11, at 18.
¹³ The antitrust law contravenes anticompetitive agreement, monopolization or attempted monopolization in order to promote innovation and consumer’s welfare. HERBERT HOVENKAMP, ET AL., IP AND ANTITRUST 1-10 (Wolters Kluwer 2010) (2003).
¹⁴ 35 U.S.C.A. § 271(d) (1988 & West Supp. 1991) (“No patent owner otherwise entitled to relief for infringement or contributory infringement of a patent shall be denied relief or deemed guilty of misuse or illegal extension of the patent right”).
¹⁶ Leslie, supra note 15, at 1273.
¹⁷ Leslie, supra note 15, at 1285-1286; See FED. TRADE COMM’N, supra note 11, at 2-3.
industry without anticompetitive coercions of dominant firms, and for improving competitive innovation, thereby enhancing publics’ welfare by harmonization of Patent System and Antitrust Law.18

To achieve the common goal of patent law and antitrust law, as a suggestion for discouraging anticompetitive predatory innovation and patent disputes in OLED industry, this dissertation researches into the new attempt of application of US Antitrust Law to predatory innovation found in OLED industry; how to reinforce antitrust regulatory influence on the patent system; and how to harmonize Patent System and Antitrust Law.

In addition, this dissertation will discuss how to rebuild patent examination guidelines and how to establish uniform and effective patent system to differentiate true improved invention from predatory innovation, referring to the Supreme Court’ decision in KSR.19

III. RESEARCH ROADMAP

Chapter Two of this dissertation provides general concept of OLED display technologies and technical trend of the global OLED display market. Specially, patent strategies by major manufactures (Idemitsu Kosan and Universal Display Co.) having market power and anticipated patent disputes around material patents are investigated in this chapter.

Chapter Three analyzes the patent system in the US, EU, KR and JP through comparative study of standards for obviousness inquiry concerning combination invention which is one of the patent strategies to extend monopoly power.

18 See Baskin, supra note 3, at 1729.
Chapter Four explores recent patent disputes challenging Idemitsu Kosan’s questionable patents including combination inventions and broadly claimed inventions, brought by prospective infringers. Additionally, comparative study for different decisions of the invalidation lawsuits according to jurisdiction in EU, KR and JP is suggested to figure out how the obviousness standards of each country are practically applied in the invalidation lawsuits, and which factors of the standards are applied critically to determine the obviousness inquiry.

Chapter Five investigates recent patent disputes challenging UDC’s blocking patent brought by competitive material manufacturers in EU, KR and JP.

Chapter Six reviews the relationship between Antitrust Law and patent misuse, and briefs comparative study of US, EU and KR approaches to Antitrust Law. Assessment of UDC and Idemitsu Kosan cases in view of patent misuse doctrine and violation of US Antitrust Law is discussed. Arguably, predatory innovation of blocking patents or anticompetitive combination invention by UDC or Idemitsu Kosan shall constitute restrictive or exclusionary conduct under Section 2 of the Sherman Act.

Chapter Seven explores issues on current patent system and patent disputes caused by predatory Invention. To achieve the common goal of patent law and antitrust law for improving competitive innovation and consumers’ welfare in OLED industry, this Chapter proposes harmonization of patent system and antitrust law, and reformation of patent system including standards of patentability regarding obviousness of combination invention.
CHAPTER TWO  RECENT PATENT STRATEGIES IN THE OLED DISPLAY INDUSTRY:

EXTENSION OF PATENT MONOPOLY

I. TECHNOLOGY OF OLED DISPLAY

A. DEFINITION OF OLED

1. History of OLED

Back in 1960s, a research group led by Martin Pope pioneered organic electroluminescence for the first time. The research of more efficient organic electroluminescence devices, however, could not proceed because they required high voltage to achieve high efficiency. In 1987, Eastman Kodak Company discovered a novel device for electroluminescence, which was the starting point for the organic light emitting diode. This device was Tris(8-hydroxyquinolinato) aluminium (Alq3) with diamine fabricated in a double layer structure by vapor deposition.

As another new type of organic electroluminescence, Richard Friend at Cambridge University launched polymer–LED (PLED) using conjugated polymers poly(p-
phenylenevinylene)(PPV)\textsuperscript{25} as an active material of OLED in 1990\textsuperscript{26} and after one year, this new creative research was confirmed and the results were improved by Braun and Heeger.\textsuperscript{27} Since 1990, the explosive growth of research on OLEDs and PLEDs has brought massive progress through the enhancement of colors, luminance efficiency\textsuperscript{28} and reliability of flat panel OLED displays\textsuperscript{29} as shown in Figure 1.

\begin{center}
\textbf{FIGURE 1: HISTORY OF OLED PRODUCTS}
\end{center}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{History of OLED products from 2009 to 2013.}
\end{figure}

\textsuperscript{25} Polymer light-emitting diodes (PLED) involve an electroluminescent conductive polymer that emits light. See Burroughes, J. H. et al., \textit{Light-Emitting Diodes Based on Conjugated Polymers}, 347 \textit{Nature}, 539, 539 (1990) (“Conjugated polymers are organic semiconductors, the semiconducting behavior being associated with the p molecular orbitals delocalized along the polymer chain. Their main advantage over non-polymeric organic semiconductors is the possibility of processing the polymer to form useful and robust structures...poly(p-phenylene vinylene) or PPV can be conveniently made into high-quality films and shows strong photoluminescence”).

\textsuperscript{26} Friend, R. H. et al., \textit{Electroluminescence in Conjugated Polymers}, 397 \textit{Nature}, 121, 121 (1999) (“Electroluminescence from conjugated polymers was reported in 1990, using poly(p-phenylene vinylene), PPV, as the single semiconductor layer between metallic electrodes”).


\textsuperscript{28} See ROGER A. MESSENGER & JERRY VENTRE, \textit{PHOTOVOLTAIC SYSTEMS ENGINEERING} 123 (CRC Press 2th ed. 2004) (“The luminous efficacy of a source is a measure of the efficiency with which the source transforms electrical energy to light energy. It is measured in lumens per watt”).

\textsuperscript{29} GREGORY P. CRAWFORD, \textit{FLEXIBLE FLAT PANEL DISPLAYS} 3 (Gregory P. Crawford ed., John Wiley & Sons Ltd, 2005) (“Flat panel display constructed of thin substrates that can be bent, flexed, conformed, or rolled to a radius of curvature of a few centimeters without losing functionality”).
2. Structure of OLED Display and Mechanism

Figure 2 shows a basic set-up for OLEDs which is composed of several thin layers through solution process\textsuperscript{30} or vacuum-deposition\textsuperscript{31} on a glass or plastic substrate. Hole injection can be achieved from a transparent anode, “indium thin oxide (ITO)”\textsuperscript{32} to the highest occupied molecular orbital (HOMO) of hole transport layer (HTL) when a current is applied to a cathode and an anode of the device. Meanwhile, electrons are introduced into the lowest unoccupied molecular orbital (LUMO) of electron transport layer (ETL) from the cathode as shown in Figure 3.

\textbf{Figure 2: Structure of OLED} \hspace{1cm} \textbf{Figure 3: Mechanism of OLED}

\textsuperscript{30} See Manuel Bösing, OVPD-Processed OLED for General Lighting 20 (Dec. 13, 2012) (unpublished Ph.D. dissertation, Rheinisch-Westfälischen Technischen College) (on file with author) (“Solution processing was mainly used for the deposition of polymer organic films as due to their high evaporation temperature, polymers could hardly be evaporated in a vacuum chamber without decomposition. More recently, it has been demonstrated that small-molecule OLED can be effectively processed from solution, too. Solution processing is obviously the cheapest way to process OLED in the lab. Organic layers can simply be deposition by means of a spin coater”).

\textsuperscript{31} Vacuum-deposition is a process used to deposition layers of material atom-by-atom or molecule-by-molecule on a solid surface. The process operates at pressures well below atmospheric pressure (i.e. vacuum). See CHARLES A. BISHOP, VACUUM-DEPOSITION ONTO WEBS, FILMS, AND FOILS 13-27 (Gary Mcguire ed., William Andrew, Inc. 2007).

\textsuperscript{32} Thin films of transparent conductive Indium tin oxide are used in organic light-emitting diodes, solar cells, flat panel displays and touch panels. In organic light-emitting diodes, ITO is used as the anode. See Kim, H. & Gilmore, C. M., Electrical, Optical, and Structural Properties of Indium–Tin–Oxide Thin Films for Organic Light-Emitting Devices, 86 JOURNAL OF APPLIED PHYSICS, Dec. 1, 1999, at 6451; FENG WEI-QUAN, et al., PROTECTION OF MATERIALS AND STRUCTURES FROM THE SPACE ENVIRONMENT 188 (Jacob Kleiman, et al. ed., Springer-Verlag Berlin Heidelberg 2013) (“Indium tin oxide (ITO, or tin-doped indium oxide) is a solid solution of indium(III) oxide (In2O3) and tin(IV) oxide (SnO2), typically 90% In2O3, 10% SnO2 by weight. It is transparent and colorless in thin layers” and one of the most widely used transparent conducting oxides because of electrical conductivity and optical transparency).
In this structure, the holes from the anode and electrons from the cathode are transferred into ETL and HTL and form excited states such as polarons or radical ions, which migrate through the electron and hole transport materials (ETMs and HTMs) and finally to the EML via “charge – hopping mechanism.” When the hole and the electron recombine to create an exciton, singlet fluorescence or triplet phosphorescence is emitted by relaxation of the exciton depending on the character of the emission materials as shown in Figure 3.

OLED displays can be driven by either passive-matrix (PMOLED) (Figure 5) or active-matrix (AMOLED) (Figure 4) addressing systems. For high resolution and large display sizes, a thin-film transistor backplane should be embedded in AMOLEDs, which is driven by switching each separate pixel on or off.

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33 See Bogolubov, N.N. et al., The Bogolubov Representation of The Polaron Model and Its Completely Integrable RPA-Approximation, 13 CONDENSED MATTER PHYSICS, 23703-1, 23703-1 (2010) (“A polaron is a quasiparticle composed of a charge and its accompanying polarization field”).


35 Id. at 11.

36 See Passive Matrix Addressing, COMPUTER DESKTOP ENCYCLOPEDIA. (retrieved Sep. 3, 2013), available at http://encyclopedia2.thefreedictionary.com/Passive+matrix+addressing (“Using one transistor for each row and one for each column, passive matrix screens are addressed one row at a time for each electronic frame. They are not as sharp and have less contrast than active matrix screens”); Yasunori Kijima, et al., RGB Luminescence from Passive-Matrix Organic LED’S, Electron Devices, 44 IEEE TRANSACTIONS ON ELECTRON DEVICES, 1222, 1222 (1997) (“In the passive matrix, OLED’s are positioned at the intersections of the addressed pairs of anodes and cathodes”).

37 An AMOLED display consists of an active matrix of OLED pixels that generate light (luminescence) upon electrical activation that have been deposited or integrated onto a thin-film-transistor (TFT) array, which functions as a series of switches to control the current flowing to each individual pixel. AMOLED displays provide higher refresh rates than their passive-matrix OLED counterparts. See Dawson, R. M. A., et al., Design of an Improved Pixel for a Polysilicon Active-Matrix Organic LED Display, 29 SID Symposium Digest of Technical Papers, Jul. 5, 2012, at 11; Bahman Hekmatshoar, Highly Stable Amorphous Silicon Thin Film Transistors and Integration Approaches for Reliable Organic Light Emitting Diode Displays on Clear Plastic, (Sep. 2010) at 12 (unpublished Ph.D. dissertation, Princeton University) (on file with author) (“Active Matrix Organic Light Emitting Diode (AMOLED) displays have all the necessary features to become the dominant technology for the next generation of flat-panel and flexible displays”).
The major difference between the OLED display and liquid crystal display (LCD) is that the OLED display works without a backlight, so that the OLED display shows a higher contrast ratio than LCD and it can be thinner and lighter than LCD.

B. Classification of OLED Materials

The designing of OLED materials is the most critical part for the high performance of the device. For display applications, huge discoveries have been made for the development and upgrading of active materials, which resulted in remarkable color reliability, device effectiveness and operational steadiness.

1. Hole Transporting Materials

Hole transporting material (HTM) is need for transportation of holes to the emission layer. This hole transporting layer is structured with a wide band gap to guarantee that the

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38 A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. See Structure of liquid crystal display (LCD), U.S. Patent No. 6,837,469 (filed May 1, 2003) (issued Jan. 4, 2005).
excitation energy of the emission layer may not be transferred to the HTM. For hole transporting materials, small molecules, which contains a few carbon atoms, are normally used. ‘Biphenyl diamine group’ such as N,N’-diphenyl-N,N’-bis(3-methylphenyl)(1,1’-biphenyl)-4,4’-diamine (TPD) has been commonly used as HTM. The improved material, N,N’-bis(1-naphthyl)-diphenyl-1,1’-biphenyl-4,4’-diamine (NPB), reveals high thermal stability due to higher Tg than TPD. Another candidate for HTM, 4,4’-di(N-carbazolyl)biphenyl (CBP) shows high triplet energy to be used for green phosphorescent emitters which readily enables energy transfer. The structures of frequently used hole transportation materials are shown in Figure 6.

![Figure 6: Hole Transporting Materials](image)

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41 Lee, supra note 20, at 27-37.
2. Hole Injection Materials (HIM)

Hole injection material (HIM) is used for the injection of holes from an anode electrode by dropping the potential barrier into the highest occupied molecular orbital (HOMO) of hole transporting layer (HTL). Figure 7 shows the structures of frequently used hole injection materials.\footnote{TSUJIMURA, supra note 39, at 38.}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{hole_injection_materials}
\caption{Hole Injection Materials}
\end{figure}

3. Emission Layer Materials (ELM)

Emission layer refers the layer where recombination of an electron and a hole is made to form an exciton which produces light emission.\footnote{TSUJIMURA, supra note 39, at 25.} To increase the efficiency of an OLED or to modify the color of emission, a small amount of another emissive material, dopant, may be added to a host emission material, which is called doping.\footnote{See Hunga, L. S. & Chen, C. H., Recent Progress of Molecular Organic Electroluminescent Materials and Devices, 39 MATERIALS SCIENCE AND ENGINEERING R, 143, 145-146 (2002.).} Figure 8 illustrates the representative ELM according to the color spectrum of blue, green, yellow, orange and red.
Fluorescent\(^{45}\) or phosphorescent\(^{46}\) materials are applied to the host materials that have light emission ability. Figure 9 shows the structures of frequently used fluorescent materials and figure 10 illustrates the structures of frequently used phosphorescent materials.\(^ {47}\) If phosphorescent dopant is added to the host material, the emission from triplet state can be possible through the heavy-metal effect since the dopant contains iridium and platinum which allows spin-orbit coupling.\(^ {48}\) Figure 11 shows the structures of frequently used phosphorescent dopants.\(^ {49}\)

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**Figure 9: Fluorescent Materials**

![Alq3, Rubrene, 2-ADN]

**Figure 10: Phosphorescent Materials**

![CBP, TCTA, BAq, UGH2]

**Figure 11: Phosphorescent Dopants**

![Images of various dopant molecules]
4. Electron Transporting Materials (ETM)

Electron transporting material is used to transfer electrons from the cathode into the emission layer, which may be applied with an electron injection layer (EIL) like LiF in order to increase the power of electron injection. Figure 12 shows the structures of frequently used electron transporting materials.

![Figure 12: Electron Transporting Materials]

C. Manufacturing of OLED Display

1. Fabrication of OLED Devices

Fabrication of OLED devices includes manufacturing processes for all of the layers in a working OLED device. These processes are composed of purification of the layer materials, deposition processes of the layers, shadow mask patterning and encapsulation.

First, the purification process is a very critical step since the physical characteristics and lifetime of an OLED rely significantly on the purity and impurity of the materials. Typically, sublimation techniques are employed for the purification.

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52 See HOMER ANTONIADIS, et al., FINAL TECHNICAL PROGRESS REPORT POLYMER OLED WHITE LIGHT DEVELOPMENT PROGRAM 9-19 (OSRAM Opto-Semiconductors, Inc. 2005); Hsiu-Chih Yeh, et al., Readily
Second, for the deposition of the layers, two kinds of evaporation processes are normally used. One is a resistive heating method using a vacuum system in an evaporation source, in which a liquid or a solid material turns into the vapor state by heating the layer material.\textsuperscript{54, 55}

The other one is an electron beam evaporation method in which the evaporation can proceed through an emission of an accelerated electron beam toward the target material to produce higher quality film than the resistive heating method.\textsuperscript{56}

Third, to implicate color patterning of OLED display, shadow masks have been used.\textsuperscript{57} Optimal patterning is very demanding for upholding display product quality, and critical factors are high accuracy and low thermal expansion.\textsuperscript{58}

The last step is the encapsulation process because protecting the device from moisture is significant to produce high-quality OLED display since OLED device is very susceptible to water damage as shown in Figure 13.\textsuperscript{59}

\textsuperscript{53} TSUJIMURA, supra note 39, at 41.
\textsuperscript{54} Id. at 25.
\textsuperscript{55} Tohma, T. et al., The Future of Active-Matrix Organic LEDs, INFORMATION DISPLAY, 20 (2001).
\textsuperscript{56} TSUJIMURA, supra note 39, at 52.
\textsuperscript{57} STEPHEN R. FORREST, VACUUM DEPOSITED ORGANIC LIGHT EMITTING DEVICES ON FLEXIBLE SUBSTRATES 25-27 (Princeton University 2002).
\textsuperscript{58} Id. at 54-55.
\textsuperscript{59} Id. at 57-58; See Jay S. Lewis & Michael S. Weaver, Thin-Film Permeation-Barrier Technology for Flexible Organic Light-Emitting Devices, 10 IEEE J. OF SELECTED TOPICS IN QUANTUM ELECTRONICS, 45, 46 (2004).
2. Power Efficiency and Life Time Issues in OLED Display

Since OLED display has been commercialized in the display market, its application has been limited to mobile phones market such as “PDAs, MP3 players, digital cameras and laptop displays.” The driving force behind this success comes from some advantages over LCDs like: self-luminescence; no backlight; low power; low cost; color selectivity; light weight; flexibility; high brightness; wide view angle; and fast response.

In terms of power consumption, as AMOLEDs generate self-luminescence, they operate without backlights and color filters, which results in reduced power

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60 SIMON FORGE & COLIN BLACKMAN, OLEDs AND E-PAPER DISRUPTIVE POTENTIAL FOR THE EUROPEAN DISPLAY INDUSTRY 25-27 (Sven Lindmark ed., European Commission Joint Research Centre Institute for Prospective Technological Studies, 2009).

61 OMKAR VYAVAHARE, FABRICATION AND CHARACTERIZATION OF ORGANIC LIGHT EMITTING DIODES FOR DISPLAY APPLICATIONS 23 (Center for Materials Science and Engineering College of Science, Rochester Institute of Technology, 2009).

62 See MICHAEL YU, BACKLIGHT TECHNOLOGY OVERVIEW 3-4 (Densitron Technologies plc 2006) (“Backlights are used for electronic devices with flat panel displays that require illumination from the back and
consumption. If the OLEDs are fully commercialized in diverse applications, there will be some benefits in energy saving and flexible display designing.

On the other hand, the organic materials of OLEDs are highly vulnerable to “degradation by oxygen and water”, so “operational as well as storage instability” leads to lost efficiency and short lifetime of the devices. This critical disadvantage of OLEDs has slowed mass production.

So called, a dark spot defect can be generated from the detaching of the cathode electrode or the degradation of organic molecule layers caused by the existence of pinholes which are produced by irregularities of the substrate surface or of the anode electrode, or the protrusion formation of organic film. Therefore, the OLEDs industry faces challenges such as device stability and displaying fine patterns with bright colors.

Another attempt to reduce the power consumption in AMOLEDs has been the development of phosphorescent light-emitting materials which have successfully replaced the current fluorescent light-emitters.

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includes devices as small as hand held PCs or as large as big screen TVs. A typical backlight consists of a light source such as a Cold Cathode Fluorescent (CCFL) or Light Emitting Diodes (LED) and a rectangular light guide, which is also referred to as light pipe”.

63 See Chun Yoon & Jae-hong Choi, Preparation of Color Filter Photo Resists for Improving Color Purity in Liquid Crystal Displays by Synthesis of Polymeric Binder and Treatment of Pigments, 30 BULL. KOREAN CHEM. SOC., 1821, 1821 (2009) (“Liquid crystal display (LCD) devices contain a color filter which can visualize color images by transmitting or absorbing light... The color filter consists of red, green and blue color pixels”).

64 Jang Hyun Kwon, et al., APPLICATIONS OF ORGANIC AND PRINTED ELECTRONICS: A TECHNOLOGY-ENABLED REVOLUTION 76 (Eugenio Cantatore ed., Springer 2013) (“AMOLEDs are the most eco-friendly display because they consume much less material, reducing or eliminating many parts used in reducing or eliminating many parts used in Liquid crystal display (LCD) like polarizer, backlight unit and color filter. Moreover, their power consumption can be lowered by turning on only the selected pixels of the display whereas AMLCD uses the backlight on the whole area of the display”).


II. TECHNICAL TREND OF OLED DISPLAY AND TREND OF THE GLOBAL OLED DISPLAY MARKET

A. TECHNICAL TREND OF OLED DISPLAY

1. Worldwide Technology Development Status of OLED Materials

At present, even though OLED efficiency has already accomplished fluorescent tube effectiveness, the fundamental problem of the lifetime and consistency coming from luminance degradation still prevents the commercialization of large scale OLED TV.  

Currently, phosphorescent OLEDs have received plenty of attention due to their ability to reach high efficiency, for instance, 100% internal quantum efficiency, up to four times higher power efficiency than conventional fluorescent OLED materials. For the foregoing reasons, the market for phosphorescent OLED materials is expected to grow rapidly.

As for phosphorescent OLEDs, normally green and red emitting iridium (Ir) complexes are used, and still, research to find high-efficiency deep-blue OLEDs on the basis of phosphorescent dopant has been challenging since deep-blue emission using the phosphorescent emitters has not been developed yet.

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68 Organic OLEDs materials are highly vulnerable to degradation by oxygen and water.
69 Jwo-Huei Jou et al., Materials, Devices, Fabrication, Characterization, and Applications for OLED Illumination and Display, 2012 ADVANCES IN MATERIALS SCIENCE AND ENGINEERING, 1, 2 (2012) (“Luminance degradation is one of the crucial problems for broad spectrum of OLED lifetime and consistency”).
70 The efficiency of phosphorescent OLEDs is based on green and red emitting iridium (Ir) complexes. See Yiru Sun, et al., Management of singlet and triplet excitons for efficient white organic light-emitting devices, 440 NATURE, 908, 908 (2006) (“Electrophosphorescent organic light-emitting devices (OLEDs) have been shown to harvest 100% of the excitons generated by electrical injection, corresponding to a fourfold increase in efficiency compared to that achievable in singlet-harvesting fluorescent OLEDs”).
The product market is divided into the submarkets of PMOLEDs and AMOLEDs. In the beginning, PMOLED products such as MP3 players and sub displays were commercialized and now dominate the market.\(^{72}\)

As of 2012, AMOLED technology is starting to be applied to mobile phones, media players and digital cameras, and in light of this trend, AMOLED products are expected to capture higher market share over the forecast period.\(^{73}\) Already, phosphorescent OLED (PHOLED) technology is making inroads into commercially available AMOLED products more and more even though the blue PHOLED emitters are still falling behind in lifetime performance.\(^{74}\) Indeed, the development of high efficient blue phosphorescent OLED materials and the improvement in quality and lifetime of red and green phosphorescent OLED materials is essential to realize an explosive increase in phosphorescent OLED devices.\(^{75}\)

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The manufacturing of OLED materials and panels takes place mostly in the Asia Pacific region, specially, Southeast Asia because of the low cost labor, raw materials and related technologies in the region.\(^\text{76}\)

2. Evolution of Technology in Worldwide Companies

Universal Display Co. (UDC) holds basic patents covering PHOLED devices, and is a leading company in developing and commercializing PHOLED technologies and materials. UDC is currently supplying PHOLED materials to manufacturers for evaluation and its red PHOLED emitter is currently being used in commercial production.\(^\text{77}\)

UDC is anticipated to take increased market share in OLED lighting industry\(^\text{78}\) as well as display industry due to the growth of PHOLED material markets.\(^\text{79}\)

Commercially available blue fluorescent OLED material is the brainchild of Idemitsu Kosan. Back in 1997, starting from synthesis of blue fluorescent, the company has invented green and red fluorescent OLED materials along with the improving the lifetime and the efficiency of blue fluorescent.\(^\text{80}\) As a main supplier of OLED fluorescent materials to OLED device manufacturers worldwide, the company has been making huge profits. Currently, it is


\(^{77}\) Finanznachrichten.de, supra note 75; See Nanomarks, UDC’s Prospects in the OLED World to Come, (Jan. 17, 2012), available at http://www.nanomarkets.net/articles/article/on_udcs_share_in_the_oled_world_to_come (“it is widely accepted that only the use of PHOLEDs will enable OLEDs to reach the efficiencies required for truly deep penetration by OLED technology”).

\(^{78}\) See Displaybank, OLED Lighting Industry Report – 2012, 1 (2012) (“OLED lighting is a surface style, and can be manufactured in a transparent or flexible appearance, and has characteristics that realize excellent color rendering and a variety of colors. OLED lighting is drawing attention as a next-generation lighting to bring a new paradigm to the lighting industry”).

\(^{79}\) See Nanomarkets, supra note 77 (“efficiency will be a key factor in contributing to OLED lighting’s cost proposition…expect OLED lighting to use very large amounts of material after 2015 or so”).

challenging phosphorescent OLED host materials for the next-generation of high-quality OLED materials.  

Samsung and LG Display (LGD) are well-known Korean manufacturers of OLED panels of which core organic layer materials are almost all imported from Japan and the United States.

SDC, which has 99.5 percent of the global OLED panel market share, has invested billions of dollars in OLED research and production facilities. This company has been extending its AMOLED application from mobile phones to cameras, tablet and TVs, and currently, producing 55" OLED TV panels, it will lead flexible transparent OLEDs commercialization such an “OLED window” and an “OLED laptop.”

LG Display Co., Ltd. is a leading manufacturer and supplier of OLEDs and flexible OLED displays using the red-, green-, and blue (RGB)-based OLED technology. Now the company is exploiting applications of their new flexible OLED panels from small-sized OLED market to real flexible displays.

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81 Mun Bo-kyung, *Who Will Lead Future AM OLED Materials Market?*, KOREA IT NEWS, Jun. 14, 2013 ("Idemitsu Kosan is working on green phosphorescent host materials while BASF is doing research on OLED materials such as green and red phosphorescent host materials and emitters").


84 *Id.*


B. TRENDS OF THE GLOBAL OLED DISPLAY MARKET

1. Analysis and Forecast of the Global OLED Panel and Display Market

With “Samsung’s Galaxy smartphone” leading the mainstream of the full color AMOLED display market, commercialization of large scale OLED TVs is just around corner and lighting products based on OLEDs are already showing up on the market.\(^{87}\) Key factors in OLED displays replacing conventional flat displays consist of saving electricity, full colors, enhanced 3D compliance, “thinner dimensions, better flexibility and transparency”, contributing to the market growth of OLED displays.\(^{88}\)

As of their mass production launch in 2007, AMOLEDs have been rapidly expanding their market share from small-sized mobile applications to AMOLED TV marketing for which LG Display and Samsung Electronics launched the world's first 55-inch OLED panel and announced a plan for the mass production of 55-inch AMOLED TV in 2013.\(^{89}\)

Experts forecasts that even though mobile phones hold the biggest share in the global OLED display market at this moment, the share of OLED TV displays are expected to overwhelm the of mobile phone market by 2015,\(^{90}\) meeting consumers’ need to replace the old generation of visual media with flexible and multifunctional OLED displays.


\(^{89}\) Juyeop Han, \textit{LG Display, 8th. OLED production line, COMPANIES AND MARKETS} (Aug. 01, 2013), available at http://www.olednet.co.kr/home/sub02.php?mid=1&r=view&uid=1312&ctg1=4.

According to the research report on the global OLED market grouping geographical regions into North America, Europe, Asia-Pacific, and the Rest of the World (RoW), Asia Pacific comes in at first with a 90.1% share of the overall OLED displays in the global market, followed by Europe with 6.2%. North America and Latin America hold a 3.8% share. The share of the Asia-Pacific region, however, is anticipated to fall below 2/3rd due to the contribution from other regions, considering the factors affecting the market growth like shrinking or maximizing the market. In contrast, Europe is rapidly occupying the market with a share in excess of 50% from 2012 to 2018 followed by North America.

According to industrial research for the global OLED market as shown in Figure 14, in the first quarter of 2013, the AMOLED market was worth US $2,389 million and the global revenue is estimated to reach $200 billion in 2018. From 2013 to 2017, application of the AMOLED market would include smartphones, tablet PCs and TVs. The portion of smartphone panels among them accounts for 73% of the entire panel market. After 2016, AMOLED market share of the smart phone is expected to remain over 60%. All AMOLED shipments in 2013 are expected to reach 193.4M, and expected to increase to 633.5M in 2017.

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92 Transparency Market Research, supra note 90.
2. Analysis and Forecast of Global OLED Material Market

The research report\textsuperscript{94} states that the Korean market of OLED emitting materials has increased by 29% from $325 million in 2012 to $417 million in 2013.

Dosan, which is one of the OLED materials manufacturers, has the highest growth rate of the market among Korean companies while the number one in increased sales amount is Dow Chemical. Idemitsu Kosan is the company that is expected to most improve its market share in the market of light-emitting materials. The reason for the steep increase in market growth of Idemitsu Kosan is that fluorescent host and dopant, hole transport materials, electron transport materials are applied to LG Display for the manufacturing of OLED TV.

The Korean market revenue is expected to be $1,095 million in 2017 and $1,548 million in 2020 for OLED emitting materials as shown in Figure 15. In the global market, the market revenue for OLED materials applicable to emissive and conductive layers is estimated to reach US $53 million in 2013, and may reach US $3.4 billion in 2017.95

III. TREND OF PATENTS IN THE OLED DISPLAY INDUSTRY

A. IP PORTFOLIO AND PATENT STRATEGY OF MAJOR MANUFACTURES

Recently, global OLED companies and OLED technologies and materials-based manufacturers have been filing patent applications and being issued patents, including Kodak, Sumitomo, Fuji Film Co., Ltd., Canon, Inc., Semiconductor Energy Laboratories Co., Idemitsu Kosan and Mitsubishi Chemical Corporation.96

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96 Universal Display Corporation, supra note 2.
According to a 2013 Annual Report on OLED materials, a total number of 1,151 patents relating the OLED organic materials were filed in Korea, Japan, the United States, and the Europe during 2012. Idemitsu Kosan, which has the most advanced technologies for OLED blue materials, is the most frequent applicant, filing 111 applications out of a total of 1,151 patent applications as shown in Figure 16.

The main issue in patent analysis of OLED organic materials is the efficiency and life time of blue light.

As a result of continuous R&D, Idemitsu Kosan owns powerful original patent portfolios relating to organic layers such as hole injection material, hole transport materials, electron transport.

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The key patents claim, specially, blue phosphorescence OLED materials that have high efficiency and long lifetime. One of the essential patents relates to the blue emission material that has the asymmetric structure of combination form with two different amine units.\textsuperscript{99} The other one is relates to blue and yellow emission materials which include amine, anthracene, metal complex or spiro-fluorene.\textsuperscript{100}

Japanese companies and research institutes are leading the field of the OLED organic materials patents as the top six most frequent applicants.

Samsung Display, Dow Chemical, Merck and E.I. du Pont, which are also within top 10 applicants, have strong patent portfolios in OLED organic materials. Another hot topic, patents for soluble materials for flexible OLED displays have been applied for mostly by Sumitomo Chemical, Mitsubishi Chemical and Konica Minolta for the next generation of flexible OLEDs.\textsuperscript{101}

In the OLED displays and lighting products market, UDC has “a strong intellectual property portfolio” relating “PHOLED (phosphorescent OLED) technologies and materials” for “red, green, blue and white OLED devices.”\textsuperscript{102}

Other material manufacturers, such as Sumitomo, Idemitsu Kosan, Merck KGaA and BASF Corporation, are also main suppliers of competing OLED materials to “the same customers to whom UDC sell its proprietary PHOLED materials.”\textsuperscript{103}


\textsuperscript{101} Olednet.co.kr, \textit{supra} note 97.

\textsuperscript{102} Universal Display Corporation, \textit{supra} note 2.

\textsuperscript{103} Id.
Eastman Kodak Company (Kodak), which has developed and patented a fundamental OLED intellectual property portfolio including an original fluorescent OLED technology since 1987, sold its assets relating its OLED business to a group of LG companies as part of the strategy.\textsuperscript{104}

In 2007, Sumitomo Chemical Company (Sumitomo) acquired Cambridge Display Technology, Inc. (CDT) which “developed and patented polymer OLED technology in 1989.”\textsuperscript{105}

Merck is selling their materials to LG Display for LG's OLED TV, and “collaborating with Taiwanese panel makers (AU Optronics and Innolux) on developing ink-jet printing of OLED TV panels” and “soluble OLED materials” which are expected to “greatly reduce OLED panel production costs.”\textsuperscript{106}

B. ISSUES OF PATENT STRATEGY

Present patent law system and the standard of examination of patentability have not kept pace with the rapid development of high technology industry. Global manufacturers who hold original material patents have been granted strategic patents that extend their monopoly on OLED display market by escaping the boundaries of the outdated patent law.

One of the patent strategies which the originators have used for improvement patents is the combination invention. They select two known OLED compounds, of which each compound has a different function for making OELD device, and combine them as a new

\textsuperscript{104} Id.

\textsuperscript{105} Id.

material patent. In another strategy, they combine a known compound with a known process in the OLED display industry as a new device patent, insisting that the new material and the new device have unexpected special results and prominent effects compared to the device using known compound or the known process in prior arts.

Another variation of the invention is adding a non-essential physical parameter in complicated form to a known material or a known device. They claim the improvement of physical characteristics of the material or the device as new inventions even though the physical properties have been already known to one skilled in the process.

Under the present patent standard, or specifically, before the decision by US Supreme Court in *KSR v. Teleflex*, the threshold of the obviousness requirement was relatively low.

Thus, these combination inventions have easily earned patent rights in the several countries even though the inventions have achieved no meaningful progress and no new technologies from the view of researchers and specialists in the display industry. The manufactures or prior users of the OLED devices already use the combination of OLED materials or the combination with known process for the fabrication of devices.

The main purpose of the combination patent holders is blocking the growth of other competitors, or preventing prior users from using the known OLED compounds or known processes without a license to the combination patent. Even though prior users pay the royalty to patent holders of the known OLED compounds or the known process, the prior

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108 According to the standard applied to the decision by lower courts and the U.S. Patent and Trademark Office, an invention was obvious if there was prior teaching, suggestion, or motivation in the art to combine the elements. This is known as the teaching-suggesting-motivating (TSM) test. A 2007 U.S. Supreme Court decision may raise the standards for all patent applicants and holders for patentability.
users and even original patentees need to get a license in return for using the combination patent.

Another strategy that the originators have employed to extend market exclusivity is timely patent litigation. Before filing the litigation, they warn the competitor the possibility of infringement of their new combination patents. Even though the relatively small material manufacturers challenge the combination patents in order to invalidate them, it takes long time and costs a lot of money. During the litigation, the infringing parties have to stop the producing materials, and eventually, the panel manufacturing companies such SDC and LGD that purchase the materials from the infringing parties are affected adversely.

C. ANTICIPATION OF PATENT DISPUTES

Big global manufacturers such as Samsung Display Co. Ltd. (SDC), Idemitsu Kosan, LG Display, Kodak, CDT, Universal Display Corporation (UDC), and Mitsubishi Chemical have been fighting each other to maintain and improve their competitive position following the expiration of fundamental OLED patents of UDC which possesses almost all of original PHOLED material patents.\(^{109}\) According to the report by UDC, “UDC’s existing fundamental phosphorescent OLED patents expire in the United States in 2017 and 2019, and in other countries of the world in 2018 and 2020.”\(^{110}\)

To make AMOLED panels, raw materials take up 50 ~ 60%, and organic materials account for 15 ~ 20% among them. So far, UDC, Idemitsu Kosan, Hodogaya and Dow Chemical have occupied the market of AMOLED materials using original technologies.\(^{111}\)

\(^{109}\) Universal Display Corporation, supra note 2.

\(^{110}\) Id.

A number of companies including “Kodak (substantially all of whose OLED assets were sold to a group of LG companies in 2009), CDT (acquired by Sumitomo in 2007), Fuji Film Co., Ltd., Canon, Inc., Semiconductor Energy Laboratories Co., Idemitsu Kosan and Mitsubishi Chemical Corporation,” “have been issued patents and are also filing patent applications relating to OLED technologies and materials,” where UDC’s patents have affected the material developments of these companies. Accordingly, “there may be issued patents or pending patent applications of third parties that would be infringed by the use of UDC’s OLED technologies or materials, thus subjecting UDC’s licensees to possible suits for patent infringement in the future.” Hypothetically, in the challenging lawsuits against UDC’s patents, the successful invalidation of UDC’s patents will allow challengers to compete more effectively against UDC.

UDC is trying to extend and enforce their patent rights into the future, but, recently, they have been exposed to third-party claims and challenges to their patents. The three PHOLED patents of UDC were invalidated in Japan in March 2011 on the grounds that the fundamental patents lack novelty and an inventive step. UDC appealed to the Japanese high court and the cases are still pending.

According to a report by UDC, “conflicts may arise between UDC and its licensees or joint development partners as to royalty rates, milestone payments or other commercial

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112 Universal Display Corporation, supra note 2.
113 Id.
114 OLED-info.com, supra note 8.
terms,” as predicted, recent invalidation actions were brought by Semiconductor Energy Laboratories Co. which is one of the material companies dependent on UDC. Even though the “basic PHOLED patent is still valid” and enforceable until 2018 in Japan, and these actions do not harm UDC’s entire portfolio, the decision shall affect OLED market products being made, used and sold in Japan.118

Korean local material manufacturers such as Duksan, LG Chemical, Doosan Electronics and Sun Fine Chemical have carried forward the AMOLED material business. The development was, however, limited to the fluorescent materials and some organic layers due to the high barriers to entry created by patents.119 As expected, local manufacturers are trying to occupy a share of the PHOLED market as strong contenders against UDC by challenging UDC’s dominance in the OLED materials market to “weaken UDC’s IP position.”120

Duksan Hi-Metal, a Korean OLED materials manufacturer, has been providing both fluorescent blue and fluorescent green OLED materials to SDC. UDC’s patent position has prevented Duksan from manufacturing phosphorescent OLED materials, which have been supplied to SDC, for the OLED panel manufacturing, since the opposed patents of UDC claimed too broad scope of compounds.121

Just after two of UDC’s PHOLED patents were invalidated by a Japanese court, in May 2011, Duksan Hi-Metal filed its own action before the Korea Intellectual Property

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117 Universal Display Corporation, supra note 2.
119 Kim, supra note 111.
120 NanoMarkets.net, supra note 87.
121 Kim, supra note 111.
Tribunal challenging five of UDC’s PHOLED patents. The patent challenges against UDC have been brought in Japan, Korea, and the EU. These law suits will be discussed in Chapter Five Analysis of Recent Patent Disputes Challenging UDC’s Blocking Patent.

On the other hand, Japan and Korea manufacturers have strategies to build their own patent portfolios using improved invention patents such as selection inventions or combination inventions to avoid the original material patents.

While Idemitsu Kosan, which has market power and a large number of critical patents over OLED materials, has tried to extend and reinforce their material patent rights in technology development and businesses by combination patents, it has been appeared in the OLED display market to debate the patentability of combination patents through patent invalidation trials by prospective infringers.

Specifically, SDC, the number one producer of AMOLED panels, is faced with a number of class action suits over patent infringement from Idemitsu Kosan due to the combination patents as discussed above.


123 Selection invention allows patenting of compounds which fall within disclosure of earlier patent if: (1) compounds not specifically disclosed in earlier patent, and (2) compounds have unexpected advantages over those compounds specifically disclosed in earlier patents.

124 Combination Invention is defined as combination or unity of elements, techniques, items, or devices, where each one performed its intended function. See Black’s law Dictionary 1157 (8th ed. 2004) (defining a combination patent as a “patent granted for an invention that unites existing components in a novel way”); see also Korean Intellectual Property Office, Patent Examination Guidelines Part III, Chapter 3, Inventive Step, Section 7 (July 2013) (“A combination invention is an invention comprising novel solutions by gathering technical features disclosed in the prior art as a whole in order to solve a technical problem”).
Even though SDC controls 99.5 percent of the global OLED panel market share, the company is seriously dependent on Japanese companies for its core technologies and materials as shown in Figure 17.

**FIGURE 17: MARKET SHARE OF OLED PANEL**


Additionally, potential litigations over overlapped material patents have been anticipated because several patent holders have claimed thousands of the same OLED compounds in the granted patents.

**D. PEACEFUL LICENSING OR NEGOTIATIONS BETWEEN MANUFACTURES**

Most primary OLED panel manufactures such as SDC, LG Display, LG Chem, AUO of Taiwan and Sony of Japan have been making strategic partnerships with materials providers.

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125 Guangzhou Etoplink Co. LTD, *supra* note 82.

126 Chimei Innolux (CMI), the Taiwanese display maker, manufactures small and medium OLED panels.
producers, for examples, Eastman Kodak Company (Kodak), Cambridge Display Technology, Ltd. (CDT), Sumitomo Chemical Company (Sumitomo), Idemitsu Kosan, Merck KGaA, BASF Corporation, and Korean local material manufacturers such as Duksan, LG Chemical, Doosan Electronics and Sun Fine Chemical.

Since the OLED device should be fabricated by combinations of several layers of materials, each material firm developing some kinds of new materials must use other firm’s material to test the performance of the new materials embedded in the fabricated device. Therefore, material firms inevitably build complementary cooperation with each other between device manufacturer and material firms, and even between material firms, although superficially, they have competition relationships. Materials and Devices showing improved efficiencies or unexpected advantageous effect in the course of solving the technical problem deserve only true innovation, which should be differentiated from predatory innovation or blocking patents.128

UDC which owns “license rights to more than 1,200 issued and pending patents” all over the world, has provided its PHOLED materials to ChiMei from Taiwan, SDC, Sony and LG Display for their manufacture of OLED displays.129

Practically almost all major OLED manufacturers such as “Samsung, LG, Lumiotec, AUO, Chi Mei/Innolux, Panasonic Idemitsu Lighting, Pioneer, Konica Minolta, Philips, Sony, and NEC” are already “UDC licensees.”130

127 Kim, supra note 111.
128 Barton, supra note 9.
130 Nanomarkets, supra note 77.
In 2011, even after The Japanese Patent Office (JPO) decided on the invalidation of the three phosphorescent OLED (PHOLED) patents of UDC, SDC and UDC entered into an “OLED Patent License Agreement” and a “Supplemental OLED Material Purchase Agreement” so that SDC would use UDC’s branded red and green PHOLED materials and technology for the launching of SDC’s new OLED display.

Samsung Electronics filed a lawsuit against AUO (AU Optronics) for infringing upon its patents with the US International Trade Commission (ITC), the District Court of Delaware and the Northern District Court of California in June 2011, and, in retaliation for the lawsuit, AUO filed a complaint against Samsung Electronics for seeking damages claiming “Samsung's various…OLED devices used in mobile phones, infringe AUO's patented technologies.” The two companies, however, withdrew all pending patent litigation and signed a cross-license agreement covering OLED to allow expanded access to each other’s patent portfolios in Jan. 2012. That agreement enhances the relationship

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131 Kim, supra note 111.
132 Samsung Mobile Display Co., Ltd (SMD) was established in January 2009 as a joint venture between Samsung Electronics and Samsung SDI.
134 AUO is Taiwanese manufacturer, the world's number 3 manufacturer of TFT-LCDs (Thin-film-transistor liquid-crystal displays) and the first AMOLED producer using UDC's PHOLED materials.
between the two companies in developing innovative digital electronic products by sharing their core technologies.

Kodak filed an infringement lawsuit against LG Electronics with the US International Trade Commission, claiming that “mobile phones and other wireless devices by LG Electronics infringed on patented Kodak technology” in 2008.\(^{138}\) In return, LG asked the ITC to investigate Kodak about possible digital camera patent infringement.\(^{139}\) Kodak, however, agreed to a cross licensing pact with LG Electronics, and in 2009 Kodak substantially sold all of its OLED assets relating to super thin OLED screen technology to LG Electronics and shared patents, ending a long-standing dispute.\(^{140}\)

Idemitsu Kosan and LG Display (LGD) have formed a strategic alliance to “develop high-performance OLED displays” since 2009.\(^{141}\) The strategic alliance covers “mutual collaboration on OLED Technology” and “cross license regarding patented technologies related to OLED,” which enables LGD to secure a high-performance source of OLED materials, and “strengthens Idemitsu’s OLED materials business” by “securing a global display leader as a customer.”\(^{142}\)

\(^{139}\) Id.
\(^{142}\) Id. (Idemitsu Kosan having a large number of critical patents regarding OLED technology, is active in the protection and application of its intellectual properties in technology development and businesses. Under this strategic alliance, “Idemitsu will benefit from securing a global display leader as a customer by supplying high-performance OLED materials including device structure proposal to LG Display. On the other hand, LG Display will reinforce research, development and manufacturing of OLED products under this strategic alliance, which will accelerate growth of LG Display's OLED business. By this win-win relationship, both companies will be able to enjoy the benefits of reciprocal synergy in the field of OLED business and build a foundation to demonstrate leadership in the industry”).
Formed in 2009, GOT (Global OLED Technology LLC) in the USA is “a leading owner and licensor of a portfolio containing over 2,400 OLED patents and pending patent applications worldwide” covering display and lighting technologies.\textsuperscript{143} GOT “signed a patent licensing agreement” with Panasonic Idemitsu OLED Lighting, Co., Ltd. (PIOL) in 2011\textsuperscript{144} and LGD in 2013, where LGD and PIOL were granted the right to use “GOT’s patent portfolios”\textsuperscript{145} under the license agreement in return for paying royalties.

Idemitsu Kosan has also collaborated with UDC since 2006, for “the development of blue phosphorescent OLED materials” and the development of “relationship to include red and green phosphorescent OLED materials” to match “UDC’s phosphorescent emitters with Idemitsu Kosan’s phosphorescent hosts and other OLED materials.”\textsuperscript{146} This cooperation aims to “improve efficiency and operational lifetime of their respective phosphorescent OLED materials” for the commercialization of “phosphorescent OLED displays and lighting products.”\textsuperscript{147}

\textsuperscript{143} Globaloledtech.com, \textit{Global OLED Technology, LLC (GOT), Signs License Agreement with Panasonic Idemitsu OLED Lighting, Co., Ltd. (PIOL), GLOBAL OLED TECHNOLOGY LLC (Sep. 7, 2011), available at http://www.globaloledtech.com/press-releases.html} (“GOT’s patent portfolio encompasses a heritage of innovation that began in the early 1980s when pioneering OLED intellectual property was created at Eastman Kodak Company’s research and development labs”).

\textsuperscript{144} \textit{Id.}


\textsuperscript{147} \textit{Id.}
For the application to “middle and large size panels,” Idemitsu has jointly developed OLED materials with Sony since 2005 and with Toshiba Mobile Display for the application to “mobile phone” in parallel.\textsuperscript{148}

UDC also has been working with Sony since 2001, so the collaboration between Idemitsu Kosan and UDC was eventually targeting developing the OLED material development for Sony’s products.\textsuperscript{149}


\textsuperscript{149} Ledger, et al., \textit{supra} note 146.
CHAPTER THREE  COMPARATIVE STUDY OF COMBINATION INVENTION IN THE US, EU, KR AND JP: STANDARDS OF OBVIOUSNESS

“Combination Invention” is defined as combination or unity of elements, techniques, items, or devices, where each one performed its intended function, and “combination patent” is a “patent granted for an invention that unites existing components in novel way.”

Ideal standards of assessing the inventive step should fulfill the “predictability” and “concrete criteria” to reach an appropriate conclusion. This Chapter reviews the standards for obviousness inquiry of combination invention in US, EU, JP and KR, as follows.

I. US

A. PATENTABILITY REGARDING OBVIOUSNESS OF COMBINATION INVENTION

PRE-KSR

For assessment of the obviousness of a claimed invention, 35 U.S.C. § 103 mandated three factors: (1) identifying the “scope and content of the prior art”; (2) 150

\[\text{See Black’s law Dictionary 1157 (8th ed. 2004) (defining a combination patent as a “patent granted for an invention that unites existing components in a novel way”); see also Korean Intellectual Property Office, supra note 124 and accompanying text.}\]

\[\text{Christoper A. Cotropia, Predictability and Nonobviousness in Patent Law After KSR, U. RICH. L. REV. 1-2, 18-19 (2013). The Supreme Court instructed a flexible approach to nonobviousness inquiry and introduced two types of “predictability” criteria. “Type I predictability” is “predictability of use” that is whether the improvement is more than the predictable use of prior art elements according to their established functions,” or “whether the combination is predictable.” KSR, 550 U.S. at 417 (citation omitted). “Type II predictability” is “predictability of the result” that is whether the combination yields predictable results. In KSR, the Court indicated that “when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.” Id. at 416.; See Michael R. Dzwonczyk, Implementing a “Predictable” obviousness Standard Post-KSR, INTELL. PROP. INST. OF CAN.’S 83RD ANN. REP. 9 (2009). This pater discussed the relationship between “predictability” and “expectedness” whether they have same concept or difference more than semantic.}\]

\[\text{Sang-Wok Han, Do we have a World-class standard of Judgment on Inventiveness?, 13: 3 KOR. ASS’N FOR INFORMEDIA L. 228 (2009).}\]

\[\text{The §103 statutory test for nonobviousness indicates that: “[a] patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as}\]
determining the “differences between the prior art and the claims”; and (3) ascertaining “the level of ordinary skill in the pertinent art” ever since the 1966 Supreme Court decision in *Graham v. John Deere Co.*\(^\text{154}\)

US Court of Appeals for the Federal Circuit created “teaching-suggesting-motivating” (TSM) test in combining prior art disclosures\(^\text{155}\) for two main objects: to avoid hindsight bias for assessing the obviousness; and to provide “uniformity and consistency in the application of *Graham.*”\(^\text{156}\)

In assessing the inventive step of a combination invention, the threshold of the obviousness requirement was relatively low under the TSM test before the decision by the US Supreme Court in *KSR v. Teleflex.*\(^\text{157}\) Under this Federal Circuit’s low level of obviousness requirement in view of ordinary skill\(^\text{158}\) and common sense,\(^\text{159}\) patentees having market power

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\(^{154}\) Teri-Lynn A. Evans, *The Effect of The Supreme Court’s Decision in KSR on The System of Patent Litigation*, 40 RUTGERS L.J. 679-680 (2009) (“The Court in *Graham* established a bare bones standard for determining whether an invention satisfied the obviousness standard, but made it clear that this was a guideline open for future interpretation...The Graham court established a four-step procedure to assess the obviousness and corresponding validity of a patent: 1) determine the scope and content of prior art; 2) determine the level of ordinary skill in the art; 3) compare the differences between the claimed invention and the prior art; and 4) assess in relation to any objective indicators of obviousness (secondary considerations such as a long-felt but unresolved need for the invention, the failure of others to make the invention, and commercial success)” (citing *Graham v. John Deere Co.*, 383 U.S. 17-18 (1966) [hereinafter *Graham*]).

\(^{155}\) Michael R. Dzwonczk, *Implementing a Predictable Obviousness Standard Post-KSR*, Intellectual Property Institute of Canada’s 83\(^{\text{rd}}\) Annual Meeting, 1 (2009); Faga, *supra* note 107, at 491 (“In 1982, Congress created the United States Court of Appeals for the Federal Circuit to handle patent law cases. The Federal Circuit was created for three purposes: ‘ending forum-shopping in patent suits, settling differences in patent-law doctrines among the circuits, and allowing a single forum to develop the expertise needed to rule on complex technological questions that arise in patent suits.’...The TSM test requires a patent applicant to demonstrate ‘a teaching, suggestion, or motivation to combine known elements on order to show that the combination is obvious.’”) (quoting KSR Int’l Co., 127 S. Ct. v. Teleflex, Inc. 1741 (2007)).


\(^{157}\) *KSR*, 550 U.S. at 398; Faga, *supra* note 107.

\(^{158}\) Environmental Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 696, 218 USPQ 865, 868 (Fed. Cir. 1983) [hereinafter *Environmental*] (“Factors that may be considered in determining the level of ordinary skill in the art may include: (1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field”); Examination Guidelines for Determining Obviousness
had easily increased their patent portfolios by strategic combination patents fabricated with technical features from prior arts.

Eventually, this patent system encouraged patentees to put together old elements in new combinations, instead of devoting theirs efforts to solve problems for creating innovation.

According to empirical research of all appellate decisions concerning patent infringement litigations over the last fifty years, the percentage of invalidity rulings based on obviousness over the contested patents sharply declined “after the Federal Circuit assumed jurisdiction of these appeals,” compared to a pre-Federal Circuit period. 160 This study proved that “the effect of the Federal Circuit on obviousness as a basis for patent invalidity” was clear and confirmed “the Federal Circuit’s pro-patent reputation.”

under 35 U.S.C. § 103 in View of the Supreme Court Decision in KSR International Co. v. Teleflex Inc., 72 FED. REG. 57528 (Oct. 10, 2007) (“The person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention.” “Factors that may be considered in determining the level of ordinary skill in the art may include: (1) ‘Type of problems encountered in the art;’ (2) ‘prior art solutions to those problems;’ (3) ‘rapidity with which innovations are made;’ (4) ‘sophistication of the technology;’ and (5) ‘educational level of active workers in the field”’) (quoting In re GPAC, 57 F.3d 1573, 1579, 35 USPQ2d 1116, 1121 (Fed. Cir. 1995); Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc., 807 F.2d 955, 962, 1 USPQ2d 1196, 1201 (Fed. Cir. 1986)).

160 KSR Int’l Co., 127 S. Ct. v. Teleflex, Inc. 1742 (2007); Janice M. Mueller, Chemicals, Combinations, and “Common Sense”: How the Supreme Court’s KSR Decision Is Changing Federal Circuit Obviousness Determinations in Pharmaceutical and Biotechnology Cases, 4 (U. Pitt. Sch. L., Research, Working Paper No. 2008-07, 2007) (“The Supreme Court in KSR instructed that common sense should be applied when deciding whether a claimed invention would have been obvious at the time it was made under 35 U.S.C. § 103(a)”).

161 Motion of the Progress & Freedom Foundation for Leave to File a Brief as Amicus Curiae in Support of the Petition for a Writ of Certiorari and Brief of the Progress & Freedom Foundation as Amicus Curiae in Support of the Petition for a Writ of Certiorari, KSR, No. 04-1350, 2005 WL 1198839, at 12-13 (May 12, 2005).


163 Id. This study shows that “among the available bases for challenging a patent’s validity, obviousness has become particularly disfavored.” Id. at 374. As the study proves, “obviousness was the predominant basis for invalidity results in the pre-Federal Circuit era and therefore was going to have to be cut back to achieve any significant decline in invalidity results. In addition, because obviousness determinations are not bright-line, but a matter of balancing a number of factors, there was more room for cutting back on obviousness results, than there was for cutting back on, for example, anticipation results.” Id.; John R. Allison & Mark A. Lemley, Empirical Evidence on the Validity of Litigated Patents, 26 AIPLA Q.J. 185, 206 (1998) (in the litigation lawsuits, the validity rate of issued patents “is significantly higher than it was before the Federal Circuit was created”).
B. PATENTABILITY REGARDING OBVIOUSNESS OF COMBINATION INVENTION
POST-KSR

In KSR International Co. v. Teleflex Inc., the United States Supreme Court held that the “Federal Circuit applied a rigid, overly narrow test that was inconsistent with §103 and the Court’s precedents.”\(^{163}\)

In KSR, to obtain a valid combination patent, a two-pronged test for nonobviousness should be satisfied.\(^{164}\) The first prong contains two Supreme Court tests: (1) the original functional “synergy test,”\(^{165}\) where issuance of a combination patent is prohibited if a court or patent examiner determines the claimed subject matter was objectively obvious to a person of ordinary skill in the pertinent art; and (2) the Graham test, examining relevant secondary factors\(^{166}\) of obviousness”\(^{167}\) such as commercial success, long-felt (unreserved needs), failure of others, and surprising/unexpected results.\(^{168}\)

\(^{163}\) KSR, 550 U.S. at 400.
\(^{164}\) Faga, supra note 107, at 485 (citing KSR Int’l Co., v. Teleflex, Inc. 127 S. Ct. 1734 (2007)).
\(^{165}\) Id. at 489; Evans, supra note 154 (“The synergy test requires that the whole combination of prior elements ‘be greater than the sum of its parts.’” quoting S. Jafar Ali, You Suggest What? How KSR Returned Bite to Nonobviousness, 16 FED. CIR. B.J. 262-263 (2006). “The test assumes that a person of ordinary skill in the pertinent art is capable of combining the prior art references in cases where no improvement or transformation of the function of the elements was part of the result.” Id. “Therefore, combination patents are only patentable under the synergy test when ‘the combination produces a new and useful result.’” Id. “As the Court stated, ‘[a] patent for a combination which only unites old elements with no change in their respective functions . . . obviously withdraws what already is known into the field of its monopoly and diminishes the resources available to skillful men.’” quoting Great Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp. (A&P), 340 U.S. 152-153 (1950). “This test was redefined in Graham to eliminate the judicial tendency to apply a hindsight-based analysis to the test.”

\(^{166}\) In United States v. Adams, the Court further expanded on the synergy doctrine.” Graham, 383 U.S. at 39 (1966). “The Court in Adams began with the main principle of the synergy doctrine that combination patents must do more than yield a predictable result in order to be eligible for patentability.” Id. at 48-49. “The Court went on to explain that ‘when the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be nonobvious.’” quoting KSR, 550 U.S. at 398 and 416).
\(^{167}\) Graham, 383 U.S. at 17 (citations omitted).
\(^{168}\) Faga, supra note 107, at 485.
“The second prong is the ‘teaching, suggestion, or motivation’ (TSM) test”…as a flexible “standard to provide insight into patent claims.”\textsuperscript{169} Eventually, the Teleflex Court established this dual-pronged system for assessment as to whether a patent is obvious and invalid over combination patents in view of a broad standard of nonobviousness, which test will “affect patent law in legal, social, and economic ways.”\textsuperscript{170}

The Supreme Court’ decision set forth the common sense test\textsuperscript{171} which acts as a standard of a person having ordinary skill in the relevant art upon testing functional synergy in the first prong.\textsuperscript{172}

Just after \textit{KSR}, federal circuit has not used the strict TSM test on the assessing obviousness, but instead the \textit{Graham} factors have been applied with taking common sense approach to validity.\textsuperscript{173}

The Supreme Court’ ruling raised the standards for all patent applicants and holders for patentability, so made it more difficult for patent holders to secure or maintain existing patents, or to obtain additional patents in the future.\textsuperscript{174}

In 2007, USPTO published the guidelines specifying that “rejection pursuant to §103 should state the reason(s) why the invention is obvious and that such determinations should

\textsuperscript{170} Faga, supra note 107, at 485.
\textsuperscript{171} Evans, supra note 154, at 691-692; \textit{KSR Int’l Co.}, 127 S. Ct. v. Teleflex, Inc. 1742 (2007); Mueller, supra note 159 and accompanying text.
\textsuperscript{172} Faga, supra note 107, at 489.
\textsuperscript{173} Milton & Anderson, supra note 173.
\textsuperscript{174} Universal Display Corporation, supra note 2.
not be conclusory, but instead be premised upon some rationale supporting the conclusion. The guidelines then listed seven rationales as follows:

1. Combining prior art elements according to known methods to yield predictable results;
2. Simple substitution of one known element for another to obtain predictable results;
3. Use of known technique to improve similar devices (methods, or products) in the same way;

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176 Examination Guidelines for Determining Obviousness under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.*, supra note 158, at 57529. “To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Office personnel must then articulate the following:”

(1) a finding that the prior art included each element claimed, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference; (2) a finding that one of ordinary skill in the art could have combined the elements as claimed by known methods, and that in combination, each element merely would have performed the same function as it did separately; (3) a finding that one of ordinary skill in the art would have recognized that the results of the combination were predictable; and (4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. *Id.*

177 *Id.* at 57530. “To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Office personnel must then articulate the following:”

(1) a finding that the prior art contained a device (method, product, etc.) which differed from the claimed device by the substitution of some components (step, element, etc.) with other components; (2) a finding that the substituted components and their functions were known in the art; (3) a finding that one of ordinary skill in the art could have substituted one known element for another, and the results of the substitution would have been predictable; and (4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. *Id.*

178 *Id.* “To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Office personnel must then articulate the following:”
(4) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;\textsuperscript{179}

(5) “Obvious to try”-choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;\textsuperscript{180}

(6) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other

\textsuperscript{179} Id. at 57529. “To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Office personnel must then articulate the following:”

(1) a finding that the prior art contained a “base” device (method, or product) upon which the claimed invention can be seen as an “improvement;” (2) a finding that the prior art contained a “comparable” device (method, or product that is not the same as the base device) that was improved in the same way as the claimed invention; (3) a finding that one of ordinary skill in the art could have applied the known “improvement” technique in the same way to the “base” device (method, or product) and the results would have been predictable to one of ordinary skill in the art; and (4) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. Id.

\textsuperscript{180} Id. at 57532. “To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Office personnel must then articulate the following:”

(1) a finding that at the time of the invention, there had been a recognized problem or need in the art, which may include a design need or market pressure to solve a problem; (2) a finding that there had been a finite number of identified, predictable potential solutions to the recognized need or problem; (3) a finding that one of ordinary skill in the art could have pursued the known potential solutions with a reasonable expectation of success; and (4) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. Id.
market forces if the variations would have been predictable to “one of ordinary skill”\textsuperscript{181} in the art;\textsuperscript{182}

(7) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.\textsuperscript{183}

II. EU

A. EPO GUIDELINES FOR PATENT EXAMINATION

\begin{itemize}
\item \textsuperscript{181}See Tom Brody, \textit{Obviousness in Patents Following the U.S. Supreme Court’s Decision, KSR International Co. v. Teleflex, Inc.}, 92 J. PAT. & TRADEMARK OFF. SOC’Y, 26, 21-22 (2010).
\item \textsuperscript{182}Examination Guidelines for Determining Obviousness under 35 U.S.C. 103 in View of the Supreme Court Decision in \textit{KSR International Co. v. Teleflex Inc.}, supra note 158, at 57533. “To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Office personnel must then articulate the following:”
\item \textsuperscript{183}Id. at 57534. “To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Office personnel must then articulate the following:”
\end{itemize}

(1) a finding that the scope and content of the prior art, whether in the same field of endeavor as that of the applicant’s invention or a different field of endeavor, included a similar or analogous device (method, or product); (2) a finding that there were design incentives or market forces which would have prompted adaptation of the known device (method, or product); (3) a finding that the differences between the claimed invention and the prior art were encompassed in known variations or in a principle known in the prior art; (4) a finding that one of ordinary skill in the art, in view of the identified design incentives or other market forces, could have implemented the claimed variation of the prior art, and the claimed variation would have been predictable to one of ordinary skill in the art; and (5) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. \textit{Id.}

\textit{Id.} at 57534. “To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Office personnel must then articulate the following:”

(1) a finding that there was some teaching, suggestion, or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) a finding that there was reasonable expectation of success; and (3) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. \textit{Id.}
The Examining Division and the Opposition Division and the Boards of Appeal of the EPO (European Patent Office) have been using “problem-solution approach” with the combination of EPC Article 52\textsuperscript{184} and Article 56\textsuperscript{185} as the standards for the assessment of an inventive step. The problem-solution approach consists of three steps: (1) determination of the closest prior art\textsuperscript{186}; (2) formulation of the objective technical problem\textsuperscript{187}; and (3) could-would approach.\textsuperscript{188}

\textsuperscript{184} The European Patent Convention: Article 52 Patenable Invention; (1) European patents shall be granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application. (2) The following in particular shall not be regarded as inventions within the meaning of paragraph 1: (a) discoveries, scientific theories and mathematical methods; (b) aesthetic creations; (c) schemes, rules and methods for performing mental acts, playing games or doing business, and programs for computers; (d) presentations of information. (3) Paragraph 2 shall exclude the patentability of the subject-matter or activities referred to therein only to the extent to which a European patent application or European patent relates to such subject-matter or activities as such.

\textsuperscript{185} The European Patent Convention: Article 56 Inventive Step; An invention shall be considered as involving an inventive step if, having regard to the state of the art, it is not obvious to a person skilled in the art. If the state of the art also includes documents within the meaning of Article 54, paragraph 3, these documents shall not be considered in deciding whether there has been an inventive step.

\textsuperscript{186} EPO Guidelines for Examination, Part G Patentability, Chapter VII 5.1 Determination of the closest prior art provides the following guidance:

The closest prior art is that which in one single reference discloses the combination of features which constitutes the most promising starting point for an obvious development leading to the invention. In selecting the closest prior art, the first consideration is that it should be directed to a similar purpose or effect as the invention or at least belong to the same or a closely related technical field as the claimed invention.

In practice, the closest prior art is generally that which corresponds to a similar use and requires the minimum of structural and functional modifications to arrive at the claimed invention (see Case T-606/89, Henkel KGaA v. Unilever NV, Unilever PLC, 1990).

In some cases there are several equally valid starting points for the assessment of inventive step. If a patent is to be granted, it may be necessary to apply the problem-and-solution approach to each of these starting points in turn. In the event of refusal, however, it is sufficient to show, on the basis of one relevant piece of prior art, that the claimed subject-matter lacks an inventive step. The closest prior art must be assessed from the skilled person’s point of view on the day before the filing or priority date valid for the claimed invention. In identifying the closest prior art, account should be taken of what the applicant himself acknowledges in his description and claims to be known. Any such acknowledgement of known art should be regarded by the examiner as being correct, unless the applicant states he has made a mistake.
Assessing the inventive step of combination invention in the context of the “problem-solution approach” complies with the guidance below:

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187 EPO Guidelines for Examination, Part G Patentability, Chapter VII 5.2 Formulation of the objective technical problem provides the following guidance:

In the second stage, one establishes in an objective way the technical problem to be solved. To do this one studies the application (or the patent), the closest prior art and the difference (also called "the distinguishing feature(s)" of the claimed invention) in terms of features (either structural or functional) between the claimed invention and the closest prior art, identifies the technical effect resulting from the distinguishing features, and then formulates the technical problem. Features which cannot be seen to make any contribution, either independently or in combination with other features, to the technical character of an invention are not relevant for assessing inventive step (see Case T-641/00, DeTeMobil Deutsche Telekom MobilNet GmbH and Giesecke & Devrient GmbH v. Comvik GSM AB, 2002).

In the context of the problem-and-solution approach, the technical problem means the aim and task of modifying or adapting the closest prior art to provide the technical effects that the invention provides over the closest prior art. The technical problem thus defined is often referred to as the "objective technical problem". The objective technical problem derived in this way may not be what the applicant presented as "the problem" in his application. The expression "technical problem" should be interpreted broadly; it does not necessarily imply that the technical solution is a technical improvement over the prior art. Thus the problem could be simply to seek an alternative to a known device or process which provides the same or similar effects or is more cost-effective.

188 EPO Guidelines for Examination, Part G Patentability, Chapter VII 5.3 Could-would approach provides the following guidance:

In the third stage the question to be answered is whether there is any teaching in the prior art as a whole that would have prompted the skilled person, faced with the objective technical problem, to modify or adapt the closest prior art while taking account of that teaching, thereby arriving at something falling within the terms of the claims, and thus achieving what the invention achieves (see G-VII, 4).

In other words, the point is not whether the skilled person could have arrived at the invention by adapting or modifying the closest prior art, but whether he would have done so because the prior art incited him to do so in the hope of solving the objective technical problem or in expectation of some improvement or advantage (see T-2/83, Rider v. Comm’n, 1984). Even an implicit prompting or implicitly recognizable incentive is sufficient to show that the skilled person would have combined the elements from the prior art (see T-257/98, Henkel Kommanditgesellschaft auf Aktien and The Procter & Gamble Company v. Unilever PLC, et al., 2002).
It is permissible to combine the disclosure of one or more documents, parts of documents or other pieces of prior art (e.g. a public prior use or unwritten general technical knowledge) with the closest prior art. However, the fact that more than one disclosure must be combined with the closest prior art in order to arrive at a combination of features may be an indication of the presence of an inventive step, e.g. if the claimed invention is not a mere aggregation of features.\(^\text{189}\)

In determining whether it would be obvious to combine two or more distinct disclosures, the examiner should also have regard in particular to the following: whether the content of the disclosures (e.g. documents) is such as to make it likely or unlikely that the person skilled in the art, when faced with the problem solved by the invention, would combine them - for example, if two disclosures considered as a whole could not in practice be readily combined because of inherent incompatibility in disclosed features essential to the invention, the combining of these disclosures should not normally be regarded as obvious; whether the disclosures, e.g. documents, come from similar, neighboring or remote technical fields; the combining of two or more parts of

\(^{189}\) EPO Guidelines for Examination, Part G Patentability, Chapter VII, 7 Combination vs. juxtaposition or aggregation (“The invention claimed must normally be considered as a whole. When a claim consists of a ‘combination of features’, it is not correct to argue that the separate features of the combination taken by themselves are known or obvious and that therefore the whole subject-matter claimed is obvious. However, where the claim is merely an ‘aggregation or juxtaposition of features’ and not a true combination, it is enough to show that the individual features are obvious to prove that the aggregation of features does not involve an inventive step”).
the same disclosure would be obvious if there is a reasonable basis for the skilled person\textsuperscript{190} to associate these parts with one another.

It would normally be obvious to combine with a prior-art document a well-known textbook or standard dictionary; this is only a special case of the general proposition that it is obvious to combine the teaching of one or more documents with the common general knowledge in the art.

It would, generally speaking, also be obvious to combine two documents one of which contains a clear and unmistakable reference to the other. In determining whether it is permissible to combine documents with an item of a prior art made public in some other way, e.g. by use, similar considerations apply.\textsuperscript{191}

**B. CASE LAW OF THE BOARD OF APPEAL**

As for assessing the inventive step of combination invention, Case Law of the Board of Appeal provides the following guidance:\textsuperscript{192}

In assessing the inventive step involved in an invention based on a combination of features, consideration must be given to whether or not the state of the art was such as to suggest to a skilled person precisely the combination of features claimed. The fact that an individual feature or a

\textsuperscript{190} EPO Guidelines for Examination, Part G Patentability, Chapter VII, 3 Person Skilled in the Art (“The ‘person skilled in the art’ should be presumed to be a skilled practitioner in the relevant field of technology, who is possessed of average knowledge and ability and is aware of what was common general knowledge in the art at the relevant date”).

\textsuperscript{191} EPO Guidelines for Examination, Part G Patentability, Chapter VII, 6. Combining Pieces of Prior art.

number of features were known does not conclusively show the obviousness of a combination.\textsuperscript{193}

The question is not whether the skilled person, with access to the entire prior art, could have made the combination according to the invention, but whether he actually would have done so in expectation of an improvement.\textsuperscript{194}

When assessing inventive step in a combination invention, the decisive criterion is not whether individual elements of the combination were known and obvious from prior art, but whether the state of the art would lead a skilled person to this particular overall combination of (possibly already known) features. Were this not so, it would be impossible for a combination consisting exclusively of known individual features to involve an inventive step.\textsuperscript{195} A mere aggregation of features must be distinguished from a combination invention.

The existence of a combination invention requires that the relationship between the features or groups of features be one of functional reciprocity or that they show a combinative effect beyond the sum of their individual effects.

The board stated that two features interact synergistically if their functions are interrelated and lead to an additional effect that goes beyond the sum of the effects of each feature taken in isolation. It is not enough that the features


solve the same technical problem or that their effects are of the same kind and
add up to an increased but otherwise unchanged effect.\textsuperscript{196}

III. KOREA

A. FORMFACTOR v. PHICOM

Before \textit{Formfactor v. Phicom},\textsuperscript{197} for assessment of obviousness, Korean judicial
precedent cases examined whether a person skilled in the art would reach a claimed invention
obviously based on the prior arts; suggestions disclosed in the prior arts; a common technical
problem to be solved described in claims; a common function or operation; close relevance of
technical fields; and the remarkableness of the effect as a whole, mainly in light of the
difficulty of technical structure.

In 2007, the Supreme Court in \textit{Formfactor} suggested concrete standards for assessing
the inventive step for the first time.

The decision in \textit{Formfactor} has been evaluated as reasonable standards for assessing
the inventive step complying with the reconciliation between “predictability” \textsuperscript{198} and
“concrete criteria” to reach an appropriate conclusion.\textsuperscript{199}

\textsuperscript{196} See T-1054/05, Comm’n v. NEC Corporation, 2008 (This appeal is against the decision of the examining
division to refuse European patent application No. 00120751.3).

\textsuperscript{197} Supreme Court of Korea [Sup. Ct.], 2005 Hu 3284, Sep. 06, 2007 (S. Kor.).

\textsuperscript{198} Cotropia, supra note 151. The Supreme Court instructed a flexible approach to nonobviousness inquiry
and introduced two types of “predictability” criteria. “Type I predictability” is “predictability of use” that is
whether the improvement is more than the predictable use of prior art elements according to their established
functions,” or “whether the combination is predictable.” \textit{KSR}, 550 U.S. at 417. “Type II predictability” is
“predictability of the result” that is whether the combination yields predictable results. In \textit{KSR}, the Court
indicated that “when a patent claims a structure already known in the prior art that is altered by the mere
substitution of one element for another known in the field, the combination must do more than yield a
predictable result.” \textit{Id.} at 416.

\textsuperscript{199} Han, supra note 152.
In Formfactor, the decision adopted the TSM test as the first prong of the standards for assessment to secure “predictability” as follows:

The inventive step of the combination invention shall not be negated merely because each element described in a claim is deemed to be known from or obvious over the cited inventions. That is, in the case of a claim disclosing a plurality of elements, determining the inventive step relies not upon each independent element, but upon the technical idea of the claimed invention, the respective elements of which are structurally combined as a whole.

When the examiner determines the inventive step by combining various prior arts, the examiner mainly considers whether the cited inventions contain a motivation or hint leading to the claimed invention by combining or assembling the prior art disclosures.

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200 Han, supra note 152, at 240. In KSR, The flexible TSM test functioned as the second prong for the test of nonobviousness.

201 Case cited supra note 197. This part of decision of the Supreme Court is similar to KSR decision as follows:

A patent composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art...Although common sense directs caution as to a patent application claiming as innovation the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the art to combine the elements as the new invention does. Inventions usually rely upon building blocks long since uncovered and claimed discoveries almost necessarily will be combinations of what, in some sense, is already known. KSR, 550 U.S. at 398.

202 Case cited supra note 197. This part of decision is similar to KSR decision as follows: “The TSM test captures a helpful insight.” KSR, 550 U.S. at 418. The TSM test requires a patent applicant to demonstrate “a teaching, suggestion, or motivation to combine known elements on order to show that the combination is obvious.” KSR Int’l Co., 127 S. Ct. v. Teleflex, Inc. 1741 (2007).
The second prong of the standards for assessment is contemporary standards applied in order to pursue “concrete criteria” to reach a conclusion and overcome the rigidity of TSM test when the TSM cannot be found in the prior arts as follows:

Nevertheless, taken into account the state of the art, the common general knowledge at the time of filing, the general technical problems of the technical field, the technical trend and demands in the industry, if the combination of prior art disclosure is deemed to be easily made by a person skilled in the art, the examiner can deny the inventive step of the claimed invention.

After Formfactor, the Korean Patent Tribunal, the Patent Court and Supreme Court seem to have frequently cited the precedent of Formfactor or followed the same analysis to the decision from Supreme Court.

B. KIPO GUIDELINES FOR PATENT EXAMINATION

The Article 29(2) of the Korean Patent Act of KIPO (Korean Intellectual Property Office) does not suggest methods for assessing the inventive step of combination invention, but instead Korean Patent Examination Guideline has been reestablished after Formfactor as follows:

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203 Han, supra note 152, at 240. In KSR, The flexible TSM test functioned as the second prong for the test of nonobviousness.

204 Case cited supra note 197. This part of decision is similar to the factors to determine the level of ordinary skill in the art in Graham and Environmental decision as follows:

Factors that may be considered in determining the level of ordinary skill in the art include: (1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field. Environmental, 713 F.2d at 696.


When determining the inventive step is, the examiner shall consider the difficulty in forming structurally combined elements as a whole based on the principle of a problem solution, rather than consider whether individually dissected elements in the claim are publicly known. In addition, the examiner shall consider the unique effect that the invention has as a whole.

1. **Mere Combination of Features**

If a combination invention described in a claim is regarded not as a meaningful combination, but merely as a juxtaposition (array) or aggregation (simple collection) of features, the inventive step of the combination invention may be denied by proving that the individual features are obvious insofar as there are no other grounds supporting the inventive step.\(^\text{207}\)

2. **Reasonable Basis for Combination**

Determining the inventive step of the combination invention can be made by combining more than two disclosures (well-known or commonly used art\(^\text{208}\)) but the combination of the disclosures is limited to the condition where a person skilled in the art can easily combine the disclosures at the time of filing. In determining the inventive step of a combination invention, care must be taken as the fact that one or more cited inventions must be combined with the

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\(^{207}\) *Id.*

\(^{208}\) Well-known art means technologies generally known in the relevant technical field like technologies widely known throughout the industry, technologies that appeared in many prior art disclosures, or technologies well known to the extent to present examples. Commonly-used art means well-known art which is used widely.
closest cited invention in order to arrive at the claimed invention may indicate
the presence of an inventive step. 209

3. TSM test
The determination whether a prior art disclosure contains a motivation, hint, or
the like for a combination shall be made by synthetically assessing the
following: whether the motivation, hint, or the like is explicitly taught in the
prior art; whether the motivation, hint, or the like is inherent from the technical
problem to be solved by the invention; or whether the motivation, hint, or the
like is part of the common general knowledge or empirical rules of a person
skilled in the art.
In general, as a prior art disclosure referring to another disclosure can be
considered to explicitly suggest a hint or motivation of a combination in the
prior art disclosure, it is regarded as obvious to combine the two disclosures
and the inventive step is therefore negated.
Also, combining a plurality of technical features in the same disclosure is
considered obvious, for a person skilled in the art would have combined the
technical features without difficulty. It is normally considered to be obvious to
combine a well-known technology with another prior art disclosure. 210

4. Close Relation of Technical Fields
Also, it should be noted that the higher number of combined cited inventions,
the more likely is that the claimed invention results from an ex post facto view

210 Id.
or lacks a valid reason for rejection. When determining whether it would have been obvious to combine two or more other prior arts, the examiner should take into consideration of the followings: whether there is good possibility to combine them; whether the prior arts come from similar or neighboring technical fields; and whether there is a reasonable basis to associate each other for the combination. \textsuperscript{211}

5. \textbf{Advantageous Effects}

If a technical feature to be combined is a well-known technology in the art, but a combination with another technical feature results in an “advantageous effect,” \textsuperscript{212} the combination is not regarded as obvious. \textsuperscript{213}

6. \textbf{A Functional Synergistic Effect}

In general, if a combination invention achieves an effect by functional interaction between technical features, which is different from or greater than the sum of the effects of the individual technical features, e.g., a combined synergistic effect, an inventive step may be acknowledged since a set of technical features is considered to be a technically meaningful combination.

In principle, the determination of the inventive step is to consider synthetically the objective, technical constitution, and functional effect of an invention described in a claim, i.e., to determine the uniqueness of the objective and the

\textsuperscript{211} Id.

\textsuperscript{212} This advantageous effect factor is similar to “surprising/unexpected results” among relevant secondary factors of obviousness when examining the \textit{Graham} test in \textit{KSR Graham}, 383 U.S. at 17.

\textsuperscript{213} Korean Intellectual Property Office, \textit{supra} note 124.
remarkableness of the effect as a whole, mainly based on the difficulty of technical structure.\textsuperscript{214}

7. Secondary Effects

However, there might be other factors\textsuperscript{215} in determining the inventive step. Thus, the examiner should not readily reach the conclusion that the claimed invention lacks an inventive step if a written opinion submitted by an applicant claims that the claimed invention is not obvious for the following reasons:

(1) If a prior art document teaches not referring to the prior art thereof,\textsuperscript{216} (2) Commercial success or favorable comments from the industry or the fact that the claimed invention had not been implemented by anybody for a long time before the claimed invention was filed may be regarded as indicative of the inventive step as secondary evidence.\textsuperscript{217} (3) The fact that a claimed invention solves a technical problem that a person skilled in the art has attempted to solve for a long time or fulfills a long-felt need may be regarded as an

\textsuperscript{214} \textit{Id.}

\textsuperscript{215} These factors are similar to relevant secondary factors of obviousness such as commercial success, long-felt (unreserved needs), failure of others, and surprising/unexpected results when examining the \textit{Graham} test in \textit{KSR. Graham}, 383 U.S. at 17.

\textsuperscript{216} \textit{Korean Intellectual Property Office, supra} note 124 (“If there is a description in the prior art document that precludes the reasoning that a person skilled in the art would easily arrive at the claimed invention, the inventive step is not denied by the prior art despite the similarity between the prior art and the claimed invention. In addition, the fact that the prior art in a prior art document is described as inferior cannot be necessarily considered as a factor that precludes the inventive step”).

\textsuperscript{217} \textit{Korean Intellectual Property Office, supra} note 124 (“However, those facts alone are not to be regarded as indicative of the inventive step. First of all, as the inventive step should be determined based on the contents disclosed in the specification (i.e., the objective, structure, and effect of the invention), commercial success is not to be regarded as a reference for the determination of the inventive step, provided that such success does not derive from the technical features of the invention but from other factors (e.g., improvement in sales techniques or advertising)”).
indication of the inventive step. If an invention is made by employing technical means which a person skilled in the art has abandoned due to technical prejudice interfering with the research and development of a technical problem in the relevant field of the art, thereby solving the technical problem, this is regarded as an indication of the inventive step. (5) If a claimed invention proposes means for overcoming technical difficulties not resolvable by other means or for solving a technical problem, this is regarded as advantageous evidence for an inventive step. (6) If a claimed invention falls within the area of a brand-new technology and has no prior art relevant to the invention, or if the closest prior art to the invention is far away from the invention, the inventive step is likely to be acknowledged.

IV. JAPAN

A. JPO GUIDELINES FOR PATENT EXAMINATION

While Japanese patent law has been founded on German patent law, the obviousness standard of the JPO (Japanese Patent Office) was originated from that of the USPTO. The nonobviousness statutory requirement is stated in Article 29(2) of Japan Patent Act as follows:

Where, prior to the filing of the patent application, a person ordinarily skilled in the art of the invention would have been able to easily make the invention

\[218\] Korean Intellectual Property Office, supra note 124 (“In addition, such a solution of a technical problem or a need should be fulfilled by the claimed invention for the first time as a matter that has been recognized by a person skilled in the art for a long time. To accept this as an indication of inventive step, objective evidence is required”).


\[220\] Homma, supra note 220.
based on an invention prescribed in any of the items of the preceding paragraph, a patent shall not be granted for such an invention notwithstanding the preceding paragraph.  

Under the Japanese Guidelines, mere aggregation of features without demonstrating any new advantages effect is obvious as an “exercise of ordinary creativity of a person skilled in the art.” Specifically, the Japanese Guidelines state:

If matters defining an invention are not linked each other functionally or operationally and the invention is a combination of each matter (mere juxtaposition of features), the invention is deemed as a mere exercise of ordinary creativity of a person skilled in the art, unless otherwise there is another ground for inferring inventive step.

The Japanese Guidelines provide factors such as “close relation of technical field,” “a close similarity of a problem to be solved,” “commonality of working, functions or

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221 Japanese Patent Office, Examination Guidelines for Patent and utility Model, Part II, Chapter 2, § 2 (July 2013). Subsection 2.2(1) defines “invention or inventions” as: “any of the inventions which were publicly known or publicly worked in Japan or elsewhere and inventions which were described in a distributed publication or made available to the public through electric telecommunication lines in Japan or elsewhere prior to the filing of the patent application.” Id. § 2.2(1), available at http://www.jpo.go.jp/tetuzuki_e/t_tokkyo_e/1312-002_e.htm.


223 Id.

224 Id. § 2.5(2)(1) (“The inventions to which any technical means of the related technical field is attempted to be applied to solve the problems in the inventions are the inventions created by exercising the ordinary creativity of a person skilled in the art. For example, a technical means that could be replaced by or added to the art described in the related technical fields could be a strong ground for showing that a person skilled in the art could arrive at the claimed invention based on the means”).

operation” for determining “probable cause or motivation” to combine when assessing obviousness of combination inventions. These factors support demonstration of obviousness with diverse overlapping rationales.

B. HOW TO REDUCE HINDSIGHT BIAS ON THE DECISION OF OBVIOUSNESS

Similarly to the TSM test which was used to overcome the hindsight bias in US patent system, the Japanese Guidelines specify supplementary provisions to reduce hindsight bias such as “advantageous effects from combining prior art,” “showing obstructions in the

A close similarity found between problems to be solved in the inventions provides strong grounds for the reasoning that the claimed invention is an idea at which a person skilled in the art could arrive by applying or combining the cited inventions.

When the cited documents are not considered to be involved in the problem to be solved that is intended to be similar to the claimed invention, further analysis of the inventions based on the state of the art is necessary to see the obviousness of the problem or see if the problem is an idea that a person skilled in the art could easily conceive.

The novelty of the claimed inventions, which are based on the cited inventions providing other problems to be solved, may be denied when it is reasoned that a person skilled in the art could easily conceive the matter used to specify the claimed inventions through other approaches, regardless of the difference between the problems to be solved by these inventions. This approach is also applied to inventions whose problems are not found, such as inventions resulting from discoveries found through trial and error. Id.

Commonality of working or functions between a matter used to specify the claimed invention and a matter used to specify the cited invention or between matters used to specify the cited inventions is a strong base for showing that a person skilled in the art could derive the claimed invention from application or a combination of the cited inventions. Id.

Implications shown in the cited inventions relevant to the claimed invention are strong grounds for the reasoning that a person skilled in the art could derive the claimed invention from the cited inventions. Id. This factor is similar to the Federal Circuit’s “suggestion test.” Homma, supra note 220, at 462.

Homma, supra note 220, at 462-470.
Id. (citing Japanese Patent Office, supra note 221, § 2.5).

Id. (citing Japanese Patent Office, supra note 221, § 2.5).

Homma, supra note 220, at 483 (“The Federal Circuit adopted a rigid teaching, suggestion, or motivation test to avoid hindsight bias”); See e.g. In re Rouffet, 149 F. 3d 1350, 1359 (Fed. Cir. 1998) (the Federal Circuit said “the suggestion to combine requirement is a safeguard against the use of hindsight combinations to negate patentability”).

Advantageous effects of the claimed inventions explicitly described in the specifications etc. are taken into consideration as a fact used for positively confirming the presence of the
prior art to reach the claimed invention,”232 “the submission of evidence,”233 “the selection of the most suitable prior art to compare against the claimed invention”234 and “secondary considerations.”235

The advantageous effects236 from combining prior arts would act persuasive evidence to prove nonobviousness. To be effective evidence, first, advantageous effects should be

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inventive step in the inventions. “Advantageous effects” means effects more advantageous to the claimed inventions than the cited inventions, selected from effects or particular effects derived from the matters used to specify the claimed inventions. Id.

Analyzing effects more advantageous to the claimed inventions than the cited inventions: The effects more advantageous to the claimed inventions than the cited inventions are attempted to be analyzed for reasoning that a person skilled in the art could have easily arrived at the claimed inventions, and the inventive step of the claimed inventions is denied when the fact that the a person skilled in the art could have easily arrived at the claimed inventions is sufficiently reasoned, regardless of the presence of the advantageous effects. However, some inventive step may not be denied when the effect more advantageous to the claimed invention than the cited invention is distinctively beyond the expectation on the basis of the state of the art. Id. § 2.5(3)(1).

Analyzing the effects claimed in written opinions or etc.: The effects claimed or proved in written opinions or etc., such as experimental results, are analyzed when the specifications provide effects more advantageous to the claimed inventions than the cited inventions and when person skilled in the art is able to presume effects more advantageous to the claimed inventions than the cited inventions from the descriptions of the specifications or drawings, although the advantageous effects are not explicitly described. However, the effects claimed or proven in the written opinions which a person skilled in the art is not able to presume from specifications, etc. should not be analyzed. Id. § 2.5(3)(2).

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232 Homma, supra note 220, at 453. The term obstruction is same to teaching away from the invention of the U.S. Patent System. The “sufficient arguments or evidence of a situation when the combination of the technologies of cited inventions…is obstructed may overcome a combination of prior art that would otherwise render an invention obvious.” Id. at 470-471.

233 Id. at 485 ("procedural evidentiary requirements help to avoid hindsight…well-known or commonly used art should be accompanied with an exemplary document insofar as possible except when it is so well-known that any evidential document seems unnecessary"); Japanese Patent Office, supra note 221, § 2.8(2).

234 Homma, supra note 220, at 485-487 (“The Japanese step in selecting the most suitable prior art is not explicitly considered in the U.S. step…the Japanese process evaluates the most suitable prior art on the grounds of other prior arts, such as second, third prior arts, common knowledge or person of ordinary skill in the art’s ordinal creativity”).

235 Id. at 473 (quoting Japanese Patent Office, supra note 221, § 2.8(6) ("Commercial successes or facts following the successes are analyzed to positively support the presence of the inventive step insofar as the examiners are convinced by applicant-submitted assertions or proof that these facts are derived from the features of the claimed inventions, not from other factors such as sales promotion techniques or advertisements")).
nonobvious, which means that the effects should be so remarkable and unforeseeable by a person of ordinary skill in the art. The second requirement is that “the effects are supposed to be disclosed in the specification” such that they shall be taken into consideration as a preponderance evidence for nonobviousness.

V. SUMMARY AND DISCUSSION

As discussed above, the standards for assessment of obviousness in four countries of US, KR, JP and EU after KSR are comprised of similar factors.

In the Court’s decision in KSR, the “functional synergy” test which “requires that the whole combination of prior elements be greater than the sum of its parts” is similar to the standard of “a functional synergistic effect” of the KIPO, “functional reciprocity” of the EPO, and “advantageous effects” of the JPO.

Broadly, the “advantageous effect” of the KIPO and the JPO embraces the “functional synergistic effect,” the “surprising/unexpected result,” and “economic synergy effect” also.

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236 Homma, supra note 220, at 471. In this review, the factor of advantageous effects is considered same to synergistic effects in KSR decision.

237 Id.

238 Id.

239 Evans, supra note 154 (“The synergy test requires that the whole combination of prior elements ‘be greater than the sum of its parts.’” quoting Ali, supra note 165.


244 Japanese Patent Office, supra note 221, § 2.5(3)

245 See Dzwonczyk, supra note 151 and accompanying text.

As introduced in above parts, the KSR case of US and the Formfactor case of Korea have similar rationale of obviousness standards, given that the guidelines of Korea contains the “functional synergistic effect” with “advantageous effects,” and likewise, the KSR considered the “surprising/unexpected results” as a secondary factor with the main factor being the “functional synergy test.” The main difference is that in KSR, the “functional synergy test” and Graham test was considered as a primary factor, followed by the TSM test, while in Formfactor, the TSM test was put first before the concrete rationale test with secondary considerations.

Japanese and Korean rules have common factors to produce the state of art, compared to US rules, in the aspect of “function.” That is to say, if there is a close similarity between a claimed invention and a prior art or between prior arts with respect to “function, work or operation,” that would reasonably lead a person skilled in the art to the claimed invention by applying and combining the prior arts.

Jurisdictions of each country, however, have showed different characteristics in the application of the standards in the obviousness trials.

\(^{247}\) Case cited supra note 197.
\(^{248}\) Case cited supra note 212 and accompanying text.
\(^{249}\) See Dzwonczyk, supra note 151 and accompanying text.
\(^{250}\) Graham, 383 U.S. at 17.
\(^{251}\) Faga, supra note 107, at 489; Evans, supra note 154 (“The synergy test requires that the whole combination of prior elements ‘be greater than the sum of its parts.’” quoting Ali, supra note 165).
\(^{252}\) The Graham court established a four-step procedure to assess the obviousness and corresponding validity of a patent: 1) determine the scope and content of prior art; 2) determine the level of ordinary skill in the art; 3) compare the differences between the claimed invention and the prior art; and 4) assess in relation to any objective indicators of obviousness with secondary considerations such as a long-felt but unresolved need for the invention, the failure of others to make the invention, and commercial success. Graham, 383 U.S. at 17-18.
\(^{253}\) The TSM test requires a patent applicant to demonstrate “a teaching, suggestion, or motivation to combine known elements on order to show that the combination is obvious.” KSR, 127 S. Ct. at 1741.
\(^{254}\) Case cited supra note 197.
\(^{256}\) Homma, supra note 220, at 489.
During 2006, 80% of patentees failed in litigation in the Japanese IP High Court, which was criticized for being against patentee.\textsuperscript{257} After KSR, however, the remarkable cases of the Japanese IP High Court concerning the analysis of obviousness applied rigid TSM test such that the Court would overcome the criticism and patentees could secure qualified patents.\textsuperscript{258} This phenomenon seems to be quite different from the other jurisdictions’ trials in other countries.

Allegedly, the KSR decision may not affect the standards of an inventive step of the EPO, but rather, standards of post-KSR in the USPTO might become similar to the “problem-solution” approach standards already in practice in the EPO.\textsuperscript{259} That is to say, the “problem-solution” approach standards specify:\textsuperscript{260}

(1) The identified problem and solution of a claim is not necessarily held as the only problem addressed by the inventor(s), but an “objective problem” may be found based on the closest prior art; (2) there is no restriction to considering only the prior art elements designed to solve the same problem; and, (3) a combination being “obvious to try”\textsuperscript{261} as an indicator of obviousness is common under the EPO practice.

\textsuperscript{257} Han, supra note 152, at 235-236.
\textsuperscript{258} The Japanese High Court demands a concrete teaching, assertive motivation to arrive the present invention. Heisei 20(Gyo-ke) No. 10096, the Japanese IP High Ct. Jan. 28, 2009. This phenomenon is totally opposite to the change from Federal Circuit’s pro-patent reputation using TSM test to con-patent after KSR.
\textsuperscript{259} Han, supra note 152, at 238 (citing Morgan D. Rosenberg & Richard J. Apley, One Small Step Towards Patent Harmonization: KSR and the EPO, INTELL. PROP. TODAY, (2014), available at http://www.iptoday.com/articles/2008-1-rosenberg.asp (“from the above problem-solution approach of the EPO, we find that the KSR standards now closely match those already in practice under the requirement of the inventive step in Europe”).
\textsuperscript{260} Rosenberg & Apley, supra note 259.
Even after the KRS case, the conclusions of recent Federal Circuit and district court cases in US concerning combination patent were similar as prior cases to KSR even though the cases considered KSR standards. Contrary to the prediction that KSR would make invalidation of granted patents easier since the decision of KSR suggested flexible standard, rejecting the rigid teaching/suggestion/motivation (TSM) test, a lot of courts are still applying the TSM test. Post-KSR, although federal court still uses the TSM test as a secondary factor, the test does not act as the major barrier.

Considering the impact on the Board of Patent Appeals and Interferences, “Board had invalidated patents 17% more often since the implementation of the KSR decision, showing that courts have much more leeway to hold a patent obvious than they did prior to the decision…this means that applicant must be much more cautious when drafting applications.”

The ground for the reasoning is that the TSM test acts as “helpful insight” as long as the test is not used mechanically or rigidly. After all, “use of TSM would survive KSR in at least some form” and “the Supreme Court did not repudiate the use of TSM altogether.”

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262 Fredrick M. Zullow & Anna Brook, Was the Concern That KSR Was a Game-Change Justified? Not for Chemical Cases Before the Federal Circuit, 80 BNA’S P., TRADEMARK & COPYRIGHT J. 1, 4 (2010).

263 Jason Rantanen, The Federal Circuit’s New Obviousness Jurisprudence: An Empirical Study, 16 STAN. TECH. L. REV. 752-753 (2013) (“Even after KSR issued, the Federal Circuit seemed to emphasize the continued viability of its “new” TSM: ‘as the Supreme Court suggests, a flexible approach to the TSM test prevents hindsight and focuses on evidence before the time of invention’”) (quoting In re Translogic Tech., Inc., 504 F.3d 1249, 1260 (Fed. Cir. 2007)).

264 Evans, supra note 154, at 692-693.

265 Evans, supra note 154, at 692 (quoting Ryan H. Flax, Patent Counsel Adjust to the Post-KSR Landscape: Courts Now Have Greater Flexibility to Rule Whether an Invention is Obvious, NAT’L L.J. S2 (2007)).

266 Emer Simic, The TSM Test is Dead! Long live the TSM Test! The Aftermath of KSR, What Was All the Fuss About?, 37 APLA QUARTERLY J. 227, 247 (2009).

267 See, e.g., Id. at 229-230 (“The Federal Circuit has not interpreted the KSR decision as having substantially altered the traditional test for obviousness, but instead stresses that it is only the method of applying the TSM test that has changed.”); Rantanen, supra note 263, at 709.
Even after *KSR* issued, the Federal Circuit seemed to emphasize “the flexibility of TSM” and “the continued viability of its ‘new’ TSM: ‘as the Supreme Court suggests, a flexible approach to the TSM test prevents hindsight and focuses on evidence before the time of invention.’”

As another opinion concerning *KSR*’s impact on chemical and pharmaceutical area over combination patents, even after *KSR*, the validity inquiry applied by Federal Circuit cases and district court cases “in chemical and pharmaceutical patent litigation” has still relied on the *Graham* factors, and not altered by *KSR.*

In *KSR*, the Supreme Court confirmed that “the combination of familiar elements according to known methods is likely obvious when it only yields predictable results,” but “the mere fact that each element in a combination was known in the prior art does not by itself invalidate a patent.” Indeed, even in light of *KSR*, the key factor for analyzing the validity of “chemical combination patents remains whether the combination of known

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268 *KSR*, 550 U.S. at 402 (citing *Graham*, 383 U.S. at 1) (“There is no necessary inconsistency between the idea underlying the TSM test and the *Graham* analysis.”); Rantanen, supra note 263, at 709.

269 See DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co., 464 F.3d 1356, 1367 (Fed. Cir. 2006) (“Our suggestion test is in actuality quite flexible and not only permits, but requires, consideration of common knowledge and common sense”); AlzaCorp. v. Mylan Labs., Inc., 464 F.3d 1286, 1291 (Fed. Cir. 2006) (“There is flexibility in our obviousness jurisprudence because a motivation may be found implicitly in the prior art. We do not have a rigid test that requires an actual teaching to combine”); Rantanen, supra note 263, at 709.

270 In re Translogic Tech., Inc., 504 F.3d 1249, 1260 (Fed. Cir. 2007). In the years immediately following *KSR*, the Federal Circuit repeated a version of this message several times. See, e.g., Black & Decker, Inc. v. Robert Bosch Tool Corp., 260 F. App’x 284, 290 (Fed. Cir. 2008) (“This court has already said that the teaching, suggestion, motivation test remains good law for obviousness, only a rigid application of that test is problematic.”); Cordis Corp. v. Medtronic Ave, Inc., 511 F.3d 1157, 1172 (Fed. Cir. 2008) (quoting *KSR*, 550 U.S. at 402) (“The Supreme Court, however, stated that ‘[t]here is no necessary inconsistency between the idea underlying the TSM test and the analysis of *Graham*, 383 U.S. at 1’”); Ortho-McNeil Pharm., Inc. v. Mylan Labs., Inc., 520 F.3d 1358, 1364 (Fed. Cir. 2008) (“As this court has explained, however, a flexible TSM test remains the primary guarantor against a non-statutory hindsight analysis such as occurred in this case.”); Rantanen, supra note 263, at 709.

271 Zullow & Brook, supra note 262, at 5-6. Virtually, *KSR* did not change significantly the standards for the validity analysis, and continuously the touchstone seems to be “predictability.” *Id.* at 1.

272 *KSR*, 550 U.S. at 398; Zullow & Brook, supra note 262, at 4.
elements produces an unexpected effect.”\textsuperscript{273} Eventually, the flexible validity inquiry in \textit{KSR} provides “balances the number of potential solutions, the innovative steps used to create the patented product, and what was obvious to a skilled person at the time.”\textsuperscript{274}

\textbf{CHAPTER FOUR \ ANALYSIS OF RECENT PATENT DISPUTES CHALLENGING IDEMITSU KOSAN’S COMBINATION PATENTS}

As discussed in Chapter 2, Idemitsu Kosan has market power and owns a large number of critical patents over OLED materials. Almost all of Idemitsu Kosan’s OLED material patents claimed too broadly such that the claimed invention is out of scope of the detailed description of the invention as required by law. The company has tried to extend and reinforce their material patent rights in technology development by its combination patent procured to preserve and extend its market power.

Until now, Idemitsu Kosan’s vulnerable patents including combination inventions and broadly claimed inventions have been challenged through patent invalidation trials by prospective infringers. Among them, three main invalidation lawsuits will be discussed as follows.

\textbf{I. THE INVALIDATION LAWSUIT OF HODOGAYA CHEMICAL V. IDEMITSU KOSAN}

In Nov. 2010, the most contested combination patent (JP 3981331) of Idemitsu Kosan was finally invalidated in Japanese Intellectual Property High Court through the invalidation

\footnotesize{\textsuperscript{273} Zullow & Brook, \textit{supra} note 262, at 4. \\
\textsuperscript{274} \textit{Id}. \textit{at} 5-6.}
lawsuit brought by Hodogaya Chemical Co., Ltd.\textsuperscript{275} under the grounds of obviousness of the combination invention. Similar invalidation lawsuits over the family patent of the JP 3981331 have been proceeding in Korea\textsuperscript{276} and EU\textsuperscript{277} brought by Hodogaya in 2011.

The comparison of the opposed patents and prior arts is summarized in Table 1.

\textbf{TABLE 1: COMPARISON OF OPPOSED PATENT AND PRIOR ARTS}

<table>
<thead>
<tr>
<th>JP 3981331</th>
<th>Claim 1</th>
<th>Prior Arts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hodogaya v. Idemitsu Kosan</td>
<td>An organic electroluminescence (EL) device organic metal as an emission layer material +diamine as a hole transporting material $\begin{array}{c} \text{Ar}^1 \text{C} = \text{C} = \text{Ar}^1 \ \text{Ar}^1 \text{C} - \text{C} = \text{O} \end{array}$ $\ldots {1}$ wherein B represents a triarylamino group, a diaminoaryl group, an aromatic ring group, a polyphenyl group or a carbazolyl group, A and C each independently represent a single bond or an arylene group having 6 to 40 carbon atoms, Ar$^1$, Ar$^2$, Ar$^3$ and Ar$^4$ each independently represent a aryl group.</td>
<td>D1\textsuperscript{278} : An organic EL device $\begin{array}{c} \text{Ir(ppy)}_3 \text{as a phosphorescent emission layer material} \ \text{Hole transporting material :} \text{m-MTDATA} \end{array}$</td>
</tr>
</tbody>
</table>

\textsuperscript{275} Hodogaya Chemical Co., Ltd., a chemical company, established in 1915 in Japan is engaged in the manufacture and sale of organic industrial chemicals. For the OLED market, Hodogaya produces mainly HTM and ETM materials (including a soluble HTM). The company is also developing Hole Injection Materials, Emitter and hosts. Oled -Info. Com, available at http://www.oled-info.com/hodogaya-chemical.

\textsuperscript{276} Kor. Patent No. 1000355 B1 (filed May 08, 2002); Kor. Patent Tribunal [KIPO Trib.], 2011dang952, Apr. 26, 2011 (S. Kor.).


An organic EL device

Iridium (Ir) complex as a phosphorescent emission layer material containing ligand (A) compound + diamine as a hole transporting material (TBPB)

TBPB

An organic EL device

Organometallic complex compound having heavy metal as an emission layer material + diamine as a hole transporting material

TBPB

D2\textsuperscript{279}: Hole transporting material

D3\textsuperscript{280}: An organic EL device

TBPB

D4\textsuperscript{281,282}: Organic Electroluminescence Materials and Display

Chapter 2: The use of triplet excitons as a dopant provides for an organic EL devices having superior characteristics.

Chapter 9: An organic EL device + Hole transporting material

Chapter 11: Triplet materials/excitons

D5\textsuperscript{283}: Multilayer organic EL devices comprising the phosphorescent guest emitter/triplet exciton (Ir(ppy))\textsubscript{3}, doped in CBP layer

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\textsuperscript{279} WO Patent No. 1995-009147 (Idemitsu Kosan) (issued Apr. 06, 1995).
\textsuperscript{280} JUNJI KIDO, ORGANIC ELECTROLUMINESCENCE MATERIALS AND DISPLAY Chapters 9, 11 (CMC Co., Ltd. 2001).
\textsuperscript{281} Id.
\textsuperscript{282} Id. at Chapter 2.
A. FAMILY PATENT JP 3981331 CASE

1. Outline of the Case

With reference to JP 3981331 (11 claims) of the invention entitled organic electroluminescence device owned by Idemitsu Kosan, Hodogaya Chemical filed an invalidation suit with the Patent Trial Board in the Japanese Patent Office (JPO) on Mar. 10, 2008. The patent office rendered the decision invalidating the patent on Feb. 26, 2009. On Jun. 29, 2009, Idemitsu Kosan filed a request for a correction trial (3 claims) to change the claims of the patent with the JPO after the decision of the invalidation trial had been rendered, and at the same time, Idemitsu Kosan appealed to the Japanese IP High court to cancel the trial decision.

On Feb. 24, 2010, the JPO dismissed the request for the correction trial on the ground that the corrected patent lacks independent patentability requirements. Idemitsu Kosan protested against the decision and filed a suit for the cancellation of the correction trial decision to the Japanese IP High court.

As of Nov. 18, 2010, the Japanese IP High Court dismissed the request for the cancellation of the correction trial decision, and finally confirmed the JPO's decision that the present invention is invalid without further request of appeal.

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286 Case of Correction Trial No. 2009-390081 (JPO, Feb. 24, 2010).
287 Heisei 22(Gyo-ke) No. 10106, Case of Request for the Cancelation of the Correction Trial Decision (Japanese IP High Ct., Nov. 18, 2010).
288 Hodogaya Chemical v. Idemitsu Kosan, Heisei 21(Gyo-ke) No. 10096, Case of Request for the Cancelation of an Invalidation trial Decision (Japanese IP High Ct., Nov. 18, 2010).
2. **Grounds for the Decision of the Invalidation Trial**

The subject-matter of claim 1 is about “an organic electroluminescence device formed of a plurality of layers of organic media including a light emitting layer and a hole transporting layer between a pair of electrodes and comprising an organic metal complex containing heavy metal as the emission layer material, wherein the organic medium contains an amine derivative represented by following general formula (I) diamine as the hole transporting material.”

Each of the cited documents D1 to D3 as shown in Table 1 pertains to the same technical field, namely organic EL device, and relates to the improvement of the high luminous efficiency and long life of the organic EL device.

According to the final determination of the Japanese IP High court:

The decision found that D1 also disclosed a high efficient organic electroluminescence device comprising a phosphorescent organic metal complex, Ir(ppy)$_3$(fac-tris(2-phenylpyridine)iridium) doped CBP (4,4’-N,N’-dicarbazolebiphenyl) host as a light emitting layer and m-MTDATA, an amine derivative as a hole transport layer, wherein the combination materials of the organic metal complex and the amine derivative are corresponding to the subject-matter of claim 1 in the present invention except that m-MTDATA in D1 does not included in the group of the diamine derivatives (I) in this present invention. D2, however, describes

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290 English Version of Hodogaya Chemical v. Idemitsu Kosan, Heisei 21(Gyo-ke) No. 10096, Case of Request for the Cancelation of an Invalidation trial Decision (Japanese IP High Ct., Nov. 18, 2010).
291 *Id.*
diamine compound, TBPB as the hole transfer material and a working example using TBPB which is corresponding to the diamine derivatives (I) in this present invention. Additionally, D3 illustrates TBPB together with m-MTDATA and \( \alpha \)-NPD as the hole transporting materials for the organic EL devices in Table 1. Accordingly, it was easily conceivable for those skilled in the art considering to select the compound 61 (TBPB) in D2 or TBPB in D3 as the hole transporting materials of the emission layer material comprised of organic metal complex containing heavy metal and use it in place of m-MTDATA of D1. In addition, the device I using m-MTDATA described in D1 is publicly known art and it was well known that the hole transfer material, TBPB which is one of the diamine derivatives (I) in this present invention, could be used in the same pattern as the hole transporting material of D1, and thus substitution by such material is not deemed to be difficult, as well. Therefore, the effect of the present invention should be fundamentally compared with the effect of the invention of D1. According to the test submitted by the plaintiff and defendant, result of comparison of effect between the organic EL device in the present invention and the organic EL device using \( \alpha \)-NPD (the one described device II in D1) in D1, revealed that no special difference in the luminous efficiencies of the organic device using \( \alpha \)-NPD in high brightness region which has equal energy level as that of TBPB. For the forgoing reasons, the present invention could easily have been made by
those skilled in the art on the basis of the inventions described in the D1 to D3 under Article 29(2) of the Japanese Patent Act (2008) ("[I]n cases where any differences exist between the invention claimed in a patent application and a quoted invention, the invention claimed in the application cannot be patented if the difference had been publicly known before the application was filed, or if any person with ordinary skill in the art can easily come up with the same idea to create the difference").

293 The patent was granted in violation of the provision of Article 29(2) of the Japanese Patent Act.

294 See Homma, supra note 220, at 462 ("The Japanese Guidelines, which state that ‘mere juxtaposition of features’ without some sort of advantageous effect from the combination is considered obvious. Therefore, in both the U.S. and Japanese patent systems, a new combination of well-known elements without some degree of skill and ingenuity is considered unpatentable").

295 Case cited supra 276.

B. FAMILY PATENT KR 10-1000355 CASE

With reference to KR 10-1000355 of the invention entitled “organic electroluminescence device” owned by Idemitsu Kosan, Hodogaya Chemical filed a request for an invalidation trial to the Korean Patent Tribunal of the KIPO on Apr. 26, 2011, and the invalidation lawsuit is still pending as of this writing.

As shown in Table 1, the subject-matter of claim 1 is about an “organic electroluminescence device formed of a plurality of layers of organic media including a light emitting layer and a hole transporting layer between a pair of electrodes and comprising a phosphorescent light emitting material made of an organic Ir complex having a group...
represented by (A) or substitution derivative thereof as a ligand in the light emitting layer, wherein the hole transport layer includes diamine compound (III) (TBPB).”

The subject-matter of claim 1 compared to that in JP 3981331 B1, limits organic metal complex containing heavy metal to “organic Ir complex having ligand ‘A’ group” as the emission layer material, and diamine derivatives to TBPB as the hole transport layer.

Hodogaya Chemical claimed the invalidation of KR 10-000355 using the same reasoning as the correction trial decision of JP 3981331 case. That is to say, the organic EL devices comprising combination of the well-known emissive organic Ir complex with a known TBPB as a hole transporting material in the litigious patent would have no significantly different effect on light emission compared to a conventional organic light emitting device.

Therefore, the present invention could easily have been made by those skilled in the art on the basis of the inventions described in the D1 to D3 under Article 29(2) on the grounds that it lacks inventive step over prior arts D1, D2 or D3 or combination of D1, D2 or D3 as shown in Table 1.

C. FAMILY PATENT EP 1391495 CASE

1. Outline of the Case

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297 Id.
298 Kororea Patent Tribunal [KIPO Trib.], 2011dang952, Apr. 26, 2011 (S. Kor.).
299 Patent Examination Guideline (2013) (“Article 29(2) of the Patent Act (Requirements for Patent Registration) Notwithstanding paragraph (1), if an invention could have been easily made, before the filing of a patent application, by a person skilled in the art to which the invention pertains based on an invention or inventions referred to in each subparagraph of paragraph (1), a patent for such an invention may not be granted”).
300 Case cited supra note 298.
With reference to EP 1391495 of the invention entitled “organic electroluminescence device” owned by Idemitsu Kosan, three plaintiffs (Hodogaya Chemical, Dragotti & Associati, and Merck Patent GmbH) filed a request for the revocation of EP 1391495 in its entirety with the Opposition Division in European Patent Office (EPO) on Aug. 18, 2009. The invalidation lawsuit is still progressing in the EPO.\textsuperscript{301}

Concerning the EP 1391495 proceeding, the plaintiffs alleged the invalidation of the opposed patent on the following grounds.\textsuperscript{302}

\textbf{2. Grounds for Invalidation Regarding Lack of Novelty}

The subject matter of claim 1 is same as that of JP 3981331. The subject-matter of claim 1 of the main request does lack novelty in view of the prior art D4. The plaintiffs apply “two-list” selection theory\textsuperscript{303} to define the present invention as a combination patent.\textsuperscript{304}

The “two-list” selection can only come about when specific features are extracted from separate lists and combined. This requires the features to be connected in some way (e.g. the features concern the same structural formula).\textsuperscript{305}


\textsuperscript{302} Cases cited supra note 301.

\textsuperscript{303} If a selection from two or more lists of a certain length has to be made in order to arrive at a specific combination of features then the resulting combination of features, not specifically disclosed in the prior art, confers novelty (the “two-lists principle”). Examples of such selections from two or more lists are the selection of: (a) individual chemical compounds from a known generic formula whereby the compound selected results from the selection of specific substituent from two or more “lists” of substituent given in the known generic formula. The same applies to specific mixtures resulting from the selection of individual components from lists of components making up the prior art mixture. Guidelines for examination of the EPO (2012), Part C-Chapter IV, item 9.8 Selection inventions (i)(a). A selection from a single list of specifically disclosed elements does not confer novelty. However, if a selection from two or more lists of a certain length has to be made in order to arrive at a specific combination of features then the resulting combination of features, not specifically disclosed in the prior art, confers novelty (the “two-lists principle”). Revised Guidelines for examination of the EPO (2013), Part G-Chapter VI, item 8. Selection Inventions (i).

\textsuperscript{304} Case App. No. 02724727.9, Hodogaya Chemical v. Idemitsu Kosan, Opposition Div. of the EPO (2008).

\textsuperscript{305} Revised Guidelines for examination of the EPO, supra note 303.
Therefore, the critical question is whether claim 1 defines a combination of specific features selected from separate lists concerning the same embodiment.\textsuperscript{306}

It is argued that claim 1 of the Main Request is anticipated by D4 as following reasons: \textsuperscript{307}

i) Chapter 2 and 9 of D4 disclose organic EL devices utilizing triplet excitons, so there is a direct link between Chapter 2 and 9.

ii) Chapter 2 and 11 of D4 refer to D5, so there is a direct link between Chapter 2 and 11.

iii) It follows that a skilled person would read Chapter 9 and 11 of D4 in combination.

Chapter 2 of D4 discloses that the use of triplet excitations as a dopant in an organic EL device allows for organic EL devices to have superior characteristics compared to conventional displays. Hence, there is a direct link between Chapter 9 relating to organic EL devices and organic hole transporting materials used in said devices and Chapter 11 relating to triplet materials/excitons.

According to “two-list” selection invention guidelines:

“When examining novelty, different passages of one document may be combined provided that there are no reasons which would prevent a skilled person from such a combination. In general, the technical teaching of examples may be combined with that disclosed elsewhere in the same

\textsuperscript{306} Case cited supra note 304.
\textsuperscript{307} Id.
document, provided that the example concerned is indeed representative for the general technical teaching disclosed in the respective document.” 308 Chapter 11 of D4 discloses Ir(ppy)$_3$ and PtOEP as preferred phosphorescent guest emitter/triplet exciton which makes it easy to anticipate organometallic complex compound having heavy metal as an emission layer material of claim 1. (Choice i) Chapter 9 of D4 illustrates TBPB, PPD, TPTE$_2$, m-TPTE, TPTE$_2$, NTPA compounds as diamine as a hole transporting material which are included in the Formula (1) in claim 1. (Choice ii) Therefore, a combination of choices i) and ii) shall be anticipated by D4. In conclusion, for the reasons set forth above, the subject-matter of claim 1 of the main request lacks novelty in view of D4 under Article 54(3) EPC. 309

3. **Grounds for Invalidation Regarding Lack of Inventive Step**

The subject-matter of claim 1 of the main request lacks an inventive step in view of the teachings of D4 alone. The court quotes the conclusion of Japanese IP High Court regarding JP 3981331. 310

The organic EL devices comprising a combination of a well-known emissive material with a known diamine hole transporting material in the litigious patent would have no

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308 “Two-list” selection invention as set forth in the Guidelines for Examination, Part C-Chapter IV, item 9.8(ii)(a). Revised Guidelines for examination of the EPO, supra note 303.

309 The European Patent Convention: Article 54 Novelty; (1) An invention shall be considered to be new if it does not form part of the state of the art. (2) The state of the art shall be held to comprise everything made available to the public by means of a written or oral description, by use, or in any other way, before the date of filing of the European patent application. (3) Additionally, the content of European patent applications as filed, the dates of filing of which are prior to the date referred to in paragraph 2 and which were published on or after that date, shall be considered as comprised in the state of the art.

310 Case cited supra note 290.
significantly different effect on light emission compared to a conventional organic light emitting device comprising NPD.\textsuperscript{311,312}

In conclusion, the subject-matter of the opposed patent as a whole, does not involve an inventive step within the meaning of Article 56 EPC.\textsuperscript{313,314}

II. \textbf{THE INVALIDATION LAWSUIT OF DOW ADVANCED DISPLAY MATERIALS V. IDEMITSU KOSAN/ROHM & HAAS ELECTRONIC MATERIALS CMP KOREA LTD. V. IDEMITSU KOSAN/MERCK V. IDEMITSU KOSAN}

On 14 May 2013, the combination patent EP 1167488 owned by Idemitsu Kosan was finally revoked by the Boards of Appeal of the EPO under the grounds of obviousness of combination invention.\textsuperscript{315} The family patent KR 10-790663 was also finally invalidated by the Patent Court of Korea on the grounds of lack of novelty of combination invention on 24 Feb. 2012.\textsuperscript{316}

The comparison of the opposed patents and prior arts is summarized in Table 2.

\textbf{A. FAMILY PATENT EP 1167488 CASE (MERCK V. IDEMITSU KOSAN)}

1. \textbf{Outline of the Case}

An opposition was filed requesting revocation of EP 1167488\textsuperscript{317} (granted on Oct. 13, 2007) in its entirety by an opponent, Merck, with the Opposition Division of the EPO on Jan. 14, 2007.\textsuperscript{318}

\textsuperscript{311} One of Hole Transporting Materials.
\textsuperscript{312} Case cited \textit{supra} note 290.
\textsuperscript{313} The European Patent Convention, \textit{supra} note 185 and accompanying text.
\textsuperscript{314} Case cited \textit{supra} note 290.
\textsuperscript{315} Case T-2020/09, Merck v. Idemitsu Kusan, 2013 (Decision of the Technical Board of Appeal of the EPO).
\textsuperscript{316} Patent Court of Korea [Patent Ct.], 2011huh(dang)4110, Feb. 24, 2012 (S. Kor.).
\textsuperscript{317} Eur. Patent App. No. 00961101.3 was filed on Sep. 20, 2000 claiming the priority from JP 26746099, filed on Aug. 21, 1999.
21, 2008. The patent was challenged under Articles 100(a) EPC\textsuperscript{318} on the grounds that it lacked an inventive step under the term of Article 56 EPC\textsuperscript{319} and under Article 100(b) EPC\textsuperscript{320} on the grounds that claim 1 did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.\textsuperscript{321}

On Aug. 7, 2009, the Opposition Division came to the conclusion that claim 1 of the main request meets the requirements of Article 100 (b) EPC and it is inventive with respect to D1 and the knowledge of the skilled person, with respect to D2 and the knowledge of the skilled person, and with respect to a combination of D1 and D2 (Article 56 and 100(a) EPC).\textsuperscript{322}

On Oct. 2, 2009, the opponent filed a notice of appeal concerning the above decision with the Boards of Appeal of the EPO, requesting that the decision of the Opposition Division should be set aside, and the patent should be revoked in its entirety.\textsuperscript{323}

The Boards of Appeal of the EPO finally decided that the subject matter of claim 1 lacked an inventive step in view of D2, so the decision under appeal was set aside and the patent was revoked on Mar. 05, 2013.\textsuperscript{324}

\textsuperscript{318} The European Patent Convention: Article 100 Grounds for Opposition; Opposition may only be filed on the grounds that: (a) the subject-matter of the European patent is not patentable under Articles 52 to 57.
\textsuperscript{319} The European Patent Convention, supra note 185 and accompanying text.
\textsuperscript{320} The European Patent Convention: Article 100 Grounds for Opposition; Opposition may only be filed on the grounds that: (b) the European patent does not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.
\textsuperscript{322} Id.
\textsuperscript{323} Case cited supra note 315.
\textsuperscript{324} Id.
### Table 2: Comparison of Opposed Patent and Prior Arts

<table>
<thead>
<tr>
<th>Claim 1</th>
<th>Prior Arts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organic electroluminescent device and organic luminous medium</strong>&lt;br&gt; An organic light emitting medium which comprises (A) styryl derivatives containing amine (III) or amine (IV) + (B) anthracene derivatives (I-a) or (II-a)</td>
<td><strong>DI 325</strong>: Organic electroluminescent device&lt;br&gt; A light emitting medium comprising a styryl amine derivative and anthracene derivative&lt;br&gt; <img src="image1" alt="Chemical Structure" /> &lt;br&gt; 4,4bis[2-(4-(N,N-diphenylamino)phenyl)vinyl] biphenyl (DPAVBi)(dopant)</td>
</tr>
</tbody>
</table>

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comprises (A) styryl derivatives containing amine (III) or amine (IV) + (B) anthracene derivatives (2b)

\[ \text{Compound(52) (host)} \]

\[ \text{9,10-di[4-(2,2-diphenyl-1-yl)phenyl]anthracene (DPVPAN) (host)} \]

D2\textsuperscript{328}: Organic electroluminescent device

D3\textsuperscript{329}: Original Patent Application

Claim 1: An organic electroluminescence device comprising electrodes; a layer of an organic light emitting medium comprising (A) monostyryl, distyryl, tristyryl and tetrastyrly derivatives containing amine, and (B) anthracene derivatives (I) or (II)

\[ \text{A}^1—\text{L}—\text{A}^2(\text{I}) \quad \text{A}^3—\text{An}—\text{A}^4(\text{II}) \]

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2. **Grounds for the Opposition and the Appeal Decision**

At the request of Opposition, Merck insisted that the subject matter of claim 1 is not inventive in the entire range defined by styryl amine derivatives (III) or (IV) and anthracene derivatives (I-a) or (II-a) as shown in Table 2.\(^\text{330}\)

D1 discloses a light emitting medium comprising the styryl derivative (DPAVBi) corresponding to formula (III) of claim 1, and anthracene derivative, compound (52) as a host material corresponding to the formula (II-a) of claim 1. The anthracene derivative in D1, however, does not correspond to the compounds described by formulas (I-a) and (II-a) of claim 1. The plaintiff also argued that the only difference between compound (52) of D1 and the compounds described by formula (II-a) of claim 1 is the substituent on the naphthalene unit.\(^\text{331}\)

Another prior art, D2, describes a light emitting medium comprising a styryl amine as a dopant, corresponding to formula (III) of claim 1, and compound E-3, electron transporting compound corresponding to formula (I-a) of claim 1.\(^\text{332}\)

Even though D2 does not explicitly disclose the combination of the styryl derivative with anthracene derivative just like in claim 1, “the Opponent argued that the combination is obvious since both the styryl amine (formula (III)) and the anthracene derivative (formula (I-a)) are disclosed in D2. The selection of compounds in claim 1 corresponds to a selection from two lists in D2, this selection having, however, no special technical effect.” “Moreover, the Opponent noted that the subject-matter of claim 1 is also not inventive with respect to a

\(^{330}\) Case cited *supra* note 321.

\(^{331}\) *Id.*

\(^{332}\) *Id.*
combination of D1 and D2 because a styryl derivative according to formula (III) is disclosed in example 1 of D1 and an anthracene derivative according to formula (I-a) is known from D2.”

The Opposition Division, however, decided that “the subject-matter of claim 1 is inventive under the grounds that there is no hint” or no “explicit examples” in D2 leading the skilled person to choose a particular combination of compounds in order to arrive at the claimed subject-matter. Moreover, “similar arguments apply to a combination of D1 and D2.” “Since there is no teaching in D2 inciting the skilled person to select a particular anthracene derivative in combination with the styryl amine of D1,” the subject-matter of claim 1 fulfills an inventive step as a selection invention.

Under the decision of the court of appeal, the subject-matter of claim 1 lacked an inventive step in view of D2 reversing the decision of the Opposition Division. D2 is relevant to an OLED including “the light emitting layer comprising: a hole injecting and transporting compound, an electron injecting and transporting compound, and a dopant.” The electron injecting and transporting compound, E-3 of D2 is corresponding to the anthracene derivative (I-a) of claim 1. The dopant, a styryl amine compound (IV) corresponds to the styryl amine derivative (III) or (IV) of claim 1.

The difference between of them is that the combination of the anthracene derivative (I-a) or (II-a) of claim 1 with the styryl amine derivative (III) or (IV) of claim 1 is not explicitly disclosed in D2.

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333 Id.
334 Case cited supra note 315.
335 Id.
336 Id.
The patentee argued that the objective technical problem is the provision of a simpler organic light emitting medium comprising two compounds. Even though D2 contains three compounds in the organic light emitting medium, and the medium of claim 1 “comprises compound (A) and (B).” That means, however, the claim 1 “covers the light emitting medium including three compounds in the same way as D2.” Therefore, the problem argued by the patentee cannot be the objective technical problem, but, instead, the provision of an alternative organic light emitting medium shall be the objective technical problem. “As a solution to this problem, the patentee proposes an organic light emitting medium according to claim 1” by combination of styryl amine (A) with anthracene derivative (B). Next, in view of this objective technical problem, whether the claimed solution was obvious was examined.\(^\text{337}\)

Claim 1 may be conceived by “a selection of certain styryl amines (IV) out of the list of dopants of D2 and certain anthracene derivatives out of the list of electron transporting and injecting materials of D2.” Without any unexpected and prominent effects as a result of this selection, however, this selection falls into “arbitrary.” “Furthermore, the styryl amine derivatives selected in claim 1 are described in D2 as ‘illustrative examples’ of the styryl amine dopant and the anthracene derivatives selected in claim 1 are disclosed in D2 as part of ‘exemplary electron transporting host materials.’” Since “an arbitrary selection out of something that is described as ‘illustrative’ and ‘exemplary’ belongs to the routine tasks of the skilled person, such a selection cannot contribute to inventive step.”\(^\text{338}\)

Although D2 does not describe the exact example of the combination of the compounds, “the teaching a document is not restricted to its preferred embodiments or those

\(^{337}\text{Id.}\)
\(^{338}\text{Id.}\)
disclosed in the examples and there is no reason why the skilled person would not choose any of the further ‘exemplary’ and ‘illustrative’ compounds disclosed in D2.” “It is true that D2 discloses a high number of electron transporting and injecting materials of which only some correspond to compound (I-a) of claim 1. However, the fact that the number of components from which a selection has to be made is high does not change the finding that this selection is arbitrary and hence not inventive.”

B. FAMILY PATENT KR 10-0790663 CASE (DOW ADVANCED DISPLAY MATERIALS v. IDEMITSU KOSAN/ROHM & HAAS ELECTRONIC MATERIALS CMP KOREA LTD. v. IDEMITSU KOSAN)

1. Outline of the Case

Dow Advanced Display Materials filed an action with the Korea Intellectual Property Tribunal on Jan. 13, 2009 challenging Idemitsu Kosan’s combination patent, KR 0790663 which was granted on Dec. 24, 2007 as a division application of the original application (KR 2001-7006271 (18 May 2001)), on the grounds that it lacked novelty under the terms of Article 29(1) of the Patent Act with respect to the original application, D3; and it lacked novelty and an inventive step under the terms of Article 29(1) and 29(2) of the Patent Act, respectively, with regard to D1 or D2.

339 Id.
340 Patent Examination Guideline (2013) (“Article 29(1) of the Patent Act (Requirements for Patent Registration) Inventions that have industrial applicability are patentable unless they fall under either of the following sub-paragraphs: (1) inventions publicly known or worked within or outside of the Republic of Korea before the filing of the patent application; or (2) inventions described in a publication distributed in the Republic of Korea or in a foreign country before the filing of the patent application or inventions published through telecommunication lines as prescribed by Presidential Decree”).
341 Id.
342 Patent Examination Guideline, supra note 299 and accompanying text.
On Mar. 29, 2011, the Tribunal came to the conclusion that the division application was legitimate and the request of amendment was admitted, and the amendment fulfills the requirement of novelty and inventive step with respect to D1 or D2.

Upon Idemitsu Kosan’s claims being upheld, the Rohm & Haas Electronic Materials CMP Korea Ltd. appealed to the Patent Court of Korea against the Tribunal’s decision on Apr. 29, 2011, requesting that the decision be set aside, and the patent be revoked in its entirety. On Jan. 13, 2012, the Patent Court of Korea reversed the decision, finding that the division application of this present invention was not legitimate since it added new technical features which were not described in the original application; even though the request for amendment was admitted, the all amended claims were not novel with respect to the original application; the patent should be invalidated.

2. Grounds Regarding lack of Inventive Step in the Invalidation Trial

D1 and D2 are related to the organic electroluminescent device in which D1 discloses 4,4bis[2-(4-(N,N-diphenylamino)phenyl)vinyl]biphenyl (DPAVBi) contained in the (A) component of claim 1 of this present invention, D2 describes 2-naphthyl antracene derivative, Compound (52) contained in the (B) component of claim 1 and compounds described by formulas (I-a) and (II-a) of claim 1.

Therefore, Dow Advanced Display Materials insisted that the subject matter of claim 1 as a whole could be produced by the combination of the technical featured of D1 and D2 at

344 Id.
345 The application of the Amendment request on Jun. 01, 2009.
346 Case cited supra note 316.
347 Case cited supra note 343.
the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.\textsuperscript{348}

The main controversial point was whether D2 "teaches away" indirectly 1-naphthyl antracene derivative of claim 1 in the present invention by the disclosure that 9,10-di(2-naphtyl-1-yl)anthracene shows the best effect.\textsuperscript{349}

The opponent, however, argued that the description stating that the 2-naphthyl antracene derivative shows outstanding effectiveness, itself may not be the basis of teaching away the 1-naphthyl antracene derivative of claim 1.\textsuperscript{350}

Upon comparing the light emitting performance between 1-naphthyl antracene derivative representing (B) component of claim 1 and 2-naphthyl antracene derivative disclosed in D2 referring the experimental results in a written description of this invention, 2-naphthyl antracene derivative shows better performance in all aspects compared to that of 1-naphthyl antracene derivative. Therefore, this combination claim 1 does not present any surprising technical effect, but rather inferior effect compared to the combination of D1 disclosing DPAVBi as a dopant and D2 describing 2-naphthyl antracene derivative as a host.\textsuperscript{351}

Under the decision of Korea Intellectual Property Tribunal, whether the composition of this invention is different from prior arts was the main issue, but whether prior arts

\textsuperscript{348} Id.
\textsuperscript{349} Id.
\textsuperscript{350} Id.
\textsuperscript{351} Id.
disclosed TSM for the combination of D1 and D2, or unexpected prominent effect was not an issue at all.\textsuperscript{352}

### III. THE INVALIDATION LAWSUIT OF MERCK v. IDEMITSU KOSAN

#### TABLE 3: COMPARISON OF OPPOSED PATENT AND PRIOR ARTS

<table>
<thead>
<tr>
<th>Claim 1</th>
<th>Prior Arts</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP 1541657</td>
<td>D1\textsuperscript{353}: Organic electroluminescent device</td>
</tr>
<tr>
<td>Merck v.</td>
<td>An organic light emitting medium comprising: a hole transport</td>
</tr>
<tr>
<td>Idemitsu Kosan</td>
<td>material (A) and an electron transport material (B)</td>
</tr>
<tr>
<td></td>
<td>( \text{Ar}_1 \text{Ar}_3 )</td>
</tr>
<tr>
<td></td>
<td>( \text{Ar}_2 \text{Y} \text{Ar}_4 )</td>
</tr>
<tr>
<td></td>
<td>(I)</td>
</tr>
<tr>
<td></td>
<td>A\textsuperscript{3}-An-A\textsuperscript{4} (6a)</td>
</tr>
<tr>
<td></td>
<td>D2 \textsuperscript{354}: Organic electroluminescent device</td>
</tr>
<tr>
<td></td>
<td>Host/Guest system with compound A23</td>
</tr>
<tr>
<td>KR 10-1018547</td>
<td>D1 \textsuperscript{355}: Organic electroluminescent device</td>
</tr>
<tr>
<td>SFC v.</td>
<td>A layer of an organic light emitting medium comprising: a hole transport</td>
</tr>
<tr>
<td>Idemitsu Kosan</td>
<td>material (A) and an electron transport material (B)</td>
</tr>
<tr>
<td></td>
<td>( \text{Ar}_1 \text{Ar}_3 )</td>
</tr>
<tr>
<td></td>
<td>Host/Guest system with compound A23</td>
</tr>
<tr>
<td></td>
<td>3-[N,N-di(4-tert-butylphenyl)amino]fluoranthene (A23)</td>
</tr>
</tbody>
</table>

\textsuperscript{352} Id.
\textsuperscript{355} Case cited supra note 353.

SFC, a Korean OLED material manufacturer, filed an action with the Korea Intellectual Property Tribunal on Dec. 29, 2011, challenging Idemitsu Kosan’s combination patent, KR 1018547 (granted on Feb. 22, 2011), on the grounds that it lacked novelty under the terms of Article 29(1) of the Patent Act with respect to D1 and it lacked an inventive step under the terms of 29(2) of the Patent Act by the combination of D1 and D2.

On 31 Dec. 2012, the Tribunal came to the conclusion that the subject matter of this invention as a whole is obvious under Article 29, paragraph (2) of the Patent Act on the grounds that: this present invention has close relationship to the technical field to the D1; it does not have specific technical problem that is solved by the invention; it has a similar

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357 SFC Co. Ltd., Korean OLED materials manufacturer, has been a supplier providing both fluorescent and phosphorescent OLED materials to Samsung Mobile Display (SMD). It made strategic business agreement with UDC since 2008, and has been partnered with Hodogaya Chemical Co. Ltd. since 2010.
358 Patent Examination Guideline, supra note 340 and accompanying text.
359 Patent Examination Guideline, supra note 342 and accompanying text.
function, work, or operation as that of D1 or can be easily made from D1 without exercising any ingenuity in the absence of a surprising superior effect to that of D1.\textsuperscript{361}

After having its claims invalidated, Idemitsu Kosan appealed to the Patent Court of Korea against the Tribunal’s decision on the amended claims\textsuperscript{362} on Mar. 04, 2013, requesting that the decision be set aside. This suit is still pending.\textsuperscript{363}

The claim 1 of this invention is a combination invention of arylamine derivatives (V) corresponding to the hole transport material (1) of D1 and anthracene derivatives (II) corresponding to the electron transport material (6a) of D1. The claim 1 includes numerical limitation where the ratio in weight percent of compound V to II is 1:99 ~ 20:80. The specific numerical values overlaps with this range (wt% amount ratio (A):(B) = 8:92 ~ 92:8) of D1 in the numerical values, 8:92 ~ 20:80).\textsuperscript{364} This “experimentally selecting an optimal numerical range from the publicly known art is normally considered as an exercise of ordinary creativity of a person skilled in the art” and “within a limited numerical range” the claimed invention does not show “more advantageous effect” than the effect of D1, hence the inventive step is generally denied.\textsuperscript{365, 366}

In this case, Idemitsu Kosan uses another strategy to secure or extend their patent rights and the market power beyond reasonable limitations they originally contained. That is to say, as discussed above Table 3, they claimed invention through modification by adding numerical limitations to their prior combination patent.

\begin{itemize}
\item \textsuperscript{361} Id.
\item \textsuperscript{362} Add the numerical limitation about the ratio of compound (A) and (B), “wt% amount ratio (A):(B) = 1.99 ~ 20:80” on claim 18.
\item \textsuperscript{363} Patent Court of Korea [Patent Ct.], 2013huh(dang)1863, (filed Feb. Mar. 04, 2013) (S. Kor.).
\item \textsuperscript{364} Case cited supra note 360.
\item \textsuperscript{365} Id.
\item \textsuperscript{366} Patent Examination Guideline of KIPO (2013) 6.4.2 Determining the Inventive Step of an Invention including Numerical Limitations.
\end{itemize}
B. FAMILY PATENT EP 1541657 CASE (MERCK v. IDEMITSU KOSAN)

Merck filed an opposition against the EP 154167\textsuperscript{367} with the Opposition Division of the EPO on Apr. 04, 2011 on the grounds of lack of inventive step with respect to a combination of D1 and D2 (Article 100(a), 56 EPC); extension of the scope of protection (Article 123 (2) EPC); and insufficient disclosure (Article 83 EPC). The Opposition Division, however, determined that the amended claim 1 fulfilled the requirement of an inventive step on 15 July 2013.\textsuperscript{368}

IV. SUMMARY AND DISCUSSION

As discussed in the above three cases, the combination patents claims the OLED device including two kinds of organic layer materials selected among HTM, HIM, ETM, EIM, or ELM which are all the necessary components of OLED device. The combined layer materials in these three cases are well-known materials in this technical field. Some of them are patented materials owned by Idemitsu Kosan, and another material is disclosed in Eastman Kodak’s patents.

According to the EPO’s decision in Hodogaya, Dragotti & Associati, Merck v. Idemitsu Kosan (EP 1391495), the novelty of combination claims in the selection from two lists in one document was denied by the “two-list principle,”\textsuperscript{369} and the inventive step was


\textsuperscript{369} “Two-list” selection invention as set forth in the Guidelines for Examination, Part C-Chapter IV, item 9.8(i)(a). Revised Guidelines for examination of the EPO, supra note 303 (“when examining novelty, different passages of one document may be combined provided that there are no reasons which would prevent a skilled person from such a combination. In general, the technical teaching of examples may be combined with that disclosed elsewhere in the same document, provided that the example concerned is indeed representative for the general technical teaching disclosed in the respective document”).
also denied reasoning that the combination of well-known materials did not have a remarkable effect in Idemitsu's patent.\footnote{370 Case cited \textit{supra} note 304.}

The determination stated that the EPO applied a selection invention theory ("two-list" selection invention) and a combination invention test at the same time to assess the combination patent where the combination was made from the selection of two materials in view of one document, having no features to give it a prominent effect, so it is nothing more than an arbitrary selection and combination.\footnote{371 \textit{Id.}}

Likewise, in the assessment of the inventive step of family patents in the KIPO (KR 10-000355) and the JPO (JP 3981331), the presence of an unexpected effect compared to that of prior arts was the primary factor in the combination of two documents. That is to say, the combination of previously known OLED materials to achieve the same function without unexpected advantageous effect shall be a predictable result, found obvious by "the application of common sense\footnote{372 \textit{KSR}, 127 S. Ct. at 1742; \textit{Mueller, supra} note 159 and accompanying text.} by a person having ordinary skill in the art."\footnote{373 \textit{Evans, supra} note 154, at 692 (quoting Milton & Anderson, \textit{supra} note 173, at 625-626).}

Assuming that the "functional synergistic effect" test of \textit{KSR}\footnote{374 \textit{Faga, supra} note 107, at 489; \textit{Evans, supra} note 154 ("The synergy test requires that the whole combination of prior elements be greater than the sum of its parts").} would be applied to this case, the organic EL devices comprising whole combination of a well-known emissive material with a known diamine hole transporting material does not reveal any improvement or transformation of their respective function of the materials greater than the sum of the effects of the individual technical features. Therefore, even considering the secondary factor
of surprising/unexpected results,\textsuperscript{375} from the perspective in \textit{KSR}, the patent of Idemitsu Kosan shall be invalid since it is not a “technically meaningful combination.”\textsuperscript{376}

The final judgment\textsuperscript{377} from the Japanese IP High court (JP 3981331) in \textit{Hodogaya} judgment supports the idea that Idemitsu Kosan’s fabricated the combination patents are not true innovation.

In \textit{Merck v. Idemitsu Kosan} (EP 1167488), the opposition division of the EPO used a rigid TSM test for the assessment of an inventive step over EP family patent, where the combination was made from the selection of two materials in view of one or two prior arts.\textsuperscript{378}

In the decision of the Board of Appeal, however, “the problem-solution approach” and “unexpected effect coming from the combination” were the main standards in the assessment. Thus the Board of Appeal decided that without prominent effects as a result of the selection and combination, the selection is arbitrary and such a selection and combination cannot contribute to an inventive step.\textsuperscript{379}

As shown in the decision of the Board of Appeal in \textit{Merck v. Idemitsu Kosan} (EP 1167488), the Board applied a different standard for assessing obviousness of a combination patent from the EPO, but as a result, the rigid TSM test of the EPO was denied in the appeal.\textsuperscript{380}

\textsuperscript{375} \textit{Graham}, 383 U.S. at 17.

\textsuperscript{376} \textit{Korean Intellectual Property Office}, \textit{supra} note 124 (“In general, if a combination invention achieves an effect by functional interaction between technical features, which is different from or greater than the sum of the effects of the individual technical features, e.g., a combined synergistic effect, the inventive step may be acknowledged since a set of technical features is considered to be a technically meaningful combination”).

\textsuperscript{377} As of 18 Nov. 2010, the Japanese IP High court finally confirmed the JPO's conclusion of the invalidation trial that the present invention has the invalidation reason without further request of appeal. Case cited \textit{supra} note 288.

\textsuperscript{378} Case cited \textit{supra} note 321.

\textsuperscript{379} Case cited \textit{supra} note 315.

\textsuperscript{380} \textit{Id.}
As to the KR family patent (KR 10-0790663), the novelty was the main reason for its invalidation in the Patent Court of Korea, while whether prior arts discloses TSM for the combination or unexpected effect was not the issue at all.\(^{381}\)

In *SFC v. Idemitsu Kosan* (KR 10-1018547 case), the contested combination patent is neither an original patent nor technically meaningful patent. That was another aspect of Idemitsu Kosan’s strategy to secure and extend their patent rights beyond reasonable limitations to which they originally pertained. The patentee claimed the invention through modification of its prior combination patent by adding numerical limitations thereto. In assessing an inventive step, “advantageous effect” was a main factor to reach the decision. The Korean Patent Tribunal, however, rejected the numerically limited combination patent on the ground that the limitation has neither technical features nor an advantageous effect.\(^{382}\)

As discussed above, combination materials in Idemitsu’s patent are all already patented materials owned by other competitive companies (original patentees), and the combined materials are frequently used for organic layers in OLED as well known OLED materials.

From the Supreme Court’s perspective in *KSR* reinforcing its underlying principle of rejecting combination patent claims with nonobviousness:\(^{383}\) “[A] patent for combination which only unites old elements with no change in their respective functions…obviously withdraws what is already known into the field of its monopoly and diminishes the resources available to skillful men,”\(^{384}\) Idemitsu’s combination patent claim shall be invalid as obvious

\(^{381}\) Kor. Patent Tribunal [Patent Trib.], 2009dang83, Mar. 29, 2011 (S. Kor.).
\(^{382}\) Case cited supra note 360.
\(^{383}\) See Faga, supra note 107, at 494.
\(^{384}\) *KSR*, 127 S. Ct. at 1739.
because the combination of well-known OLED materials used for the fabrication of OLED panel is “within the grasp of a person of ordinary skill in the relevant art.”

As discussed in Chapter 3, the standards for the assessment of obviousness in four countries of US, KR, JP and EU are comprised of similar factors after KSR. According to the study in Chapter 4, however, each country applied different factors even on the same case and the following decisions of each country were not same. Even in one country, the decision of the first trial was overturned by the appeal court. More than ever, the unification of the standards for the assessment of obviousness has been demanded in the combination invention of material patents.

The Supreme Court’ decision set forth the common sense test for the functional synergy test in the first prong.

According to the common sense test, if the combination consisted of the selected two materials in view of one or two prior arts does not show functional change, the combination shall fall into something obvious that a person having ordinary skill in the relevant art would make as a matter of common sense. On the other hand, “it would not be a matter of common sense to include a new element or produce a new function or unpredictable result”, and therefore, such a combination shall be nonobvious to be patentable.

Among previous cases, none of the KR cases applied TSM test, but instead determinations were made using other criteria: comparison of difference in function or

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385 KSR, 127 S. Ct. at 1739.
386 Evans, supra note 154, at 691-692; KSR, 127 S. Ct. at 1742; Mueller, supra note 159 and accompanying text.
387 Faga, supra note 107, at 489.
388 Mueller, supra note 159 and accompanying text.
389 Evans, supra note 154, at 691-692 (quoting Milton & Anderson, supra note 173).
390 Case cited supra note 276; Case cited supra note 381; Case cited supra note 360.
operation between a claimed invention and prior arts; unexpected advantageous effect; or a teaching away defense.

In *Dow Advanced Display Materials v. Idemitsu Kosan/Rohm & Haas Electronic Materials CMP Korea Ltd. v. Idemitsu Kosan* (KR 10-0790663 case), the Korea Intellectual Property Tribunal did not consider the common sense test\(^{391}\) as a person having ordinary skill in the relevant art, but instead simply compare the chemical structure of the claimed invention from that of the prior art.\(^{392}\)

Presumably, this trial estimated the level of a person having ordinary skill too low for obviousness inquiry, such that it erred in holding invalid patents to be valid by the reasoning that the claimed composition had functional difficulties in the combination.\(^{393}\)

It, however, should have tested synergy effect of the combination of modified materials from the prior arts in the technical common sense criteria since the combination did not show any advantageous effect without functional change.\(^{394}\)

In the appeal trial, the Patent Court of Korea, however, overturned the first trial’s decision and invalidated the Idemitsu patent on the grounds of the lack of novelty.\(^{395}\)

In this practical sense, the combination of previously known OLED materials to achieve the same function without unexpected advantage effect shall be a predictable result, founded obvious, “from the application of common sense by a person having ordinary skill in the art.”\(^{396}\)

\(^{391}\) *KSR*, 127 S. Ct. at 1742; *Mueller*, *supra* note 159 and accompanying text.

\(^{392}\) Case cited *supra* note 381.

\(^{393}\) *Id.*

\(^{394}\) *Id.*

\(^{395}\) Case cited *supra* note 316.

In addition, under the reasoning of the post-KSR in chemical and pharmaceutical area, the combination of previously known OLED materials to achieve the same function without unexpected advantage effect shall be a predictable result, founded obvious, “from the application of common sense by a person having ordinary skill in the art.”

In the light of the “predictability” standard in Formfactor and KSR, a person of ordinary skill at the time of the invention would likely combine known OLED materials to fabricate the device, but the device composed of the combination does no more than yield predictable result (emitting efficiency or properties of the device), which invention shall be determined to be obvious.

Even Idemitsu’s florescent material patents (e.g. antracene derivatives) may not be defined as original material patents at all, where the claims were formulated by variation or modification of substituents of original chemical materials in patents of Eastman Kodak. Moreover, the questionable combination patents may not be perfect enough to withstand invalidation challenges because the combination patents only claim the combination of two

\footnote{397 Zullow & Brook, supra note 262, at 5-6 (in “post-KSR Federal Circuit cases and district court cases, the validity inquiry applied by Courts in chemical and pharmaceutical patent litigation has remained largely the same...before and after KSR, the main question with chemical combination patents remains whether the combination of known elements produces an unexpected effect”).

398 Evans, supra note 154, at 692 (quoting Milton & Anderson, supra note 173, at 625-626).

399 Han, supra note 152, at 240. In KSR, The flexible TSM test functioned as the second prong for the test of nonobviousness.

400 Cotropia, supra note 151. The Supreme Court instructed a flexible approach to nonobviousness inquiry and introduced two types of “predictability” criteria. “Type I predictability” is “predictability of use” that is whether the improvement is more than the predictable use of prior art elements according to their established functions,” or “whether the combination is predictable.” KSR, 550 U.S. at 417. “Type II predictability” is “predictability of the result” that is whether the combination yields predictable results. In KSR, the Court indicated that “when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.” In this regard, if the combination “does no more than yield predictable results,” the invention would be obvious. Id. at 416.}
kinds of materials among more than ten kinds of organic layer materials that are essential materials to constitute OLED devices.

However, even if patented materials owned by material manufacturers were to be combined with Idemitsu’s combination material, using the patented combination materials would constitute an infringement on Idemitsu’s combination patent, since the OLED devices are normally produced by combinations of several materials.

As a result, several invalidation law suits initiated by prospective infringer such as material manufacturers or material makers against Idemitsu Kosan’s questionable patents including combination patents are pending in the KIPO or the EPO debating the patentability of combination patents. More than 14 invalidation trial cases against Idemitsu are proceeding in the Korean Patent Tribunal as follows.

Specifically, after one combination patent was invalidated in the KIPO in 2012 through an action brought by SFC (one of OLED material suppliers), SFC filed another invalidation trial against Idemitsu Kosan’s patent alleging that the claims were over broad on 31 Oct. 2012.403

On 27 July 2012, another Korean OLED material manufacturer, Ainnos (one of OLED material suppliers) challenged Idemitsu Kosan’s patent on the grounds that it lacked novelty and an inventive step on 27 July 2012.405

401 Case cited supra note 360.
On 30 Dec. 2010, in Dow Advanced Display Materials v. Idemitsu Kosan, the Idemitsu Kosan’s patent was invalidated in the Korean Patent Tribunal under the grounds that it lacked an inventive step over combination of prior arts.

In Merck v. Idemitsu Kosan, opponent requested the revocation of EP 1553154 (granted Dec. 23, 2009) to the Opposition Division of the EPO; on the grounds that it lacks of sufficient disclosure (Article 100(b) 83 EPC); on the grounds that it lacks novelty (Article 100(a) 52 54(1)(2) EPC); and on the grounds that it lacks inventive step (Article 100(a) 56 EPC).

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408 The European Patent Convention, supra note 318 and accompanying text.
Figure 18. <Status of Invalidation Trials of UDC Japanese Patents and Family Patents>

1. **Priority**
   - **US 1999-311126**
     - **Priority**
       - **EP 1933395**
       - **EP 1449238**
   - **Patent family**
     - **JP 3992929**
       - **Division application**
         - Invalidation lawsuit: application No. 2010-800044 (Mar. 15, 2010)
         - Final rejection (Feb. 22, 2011)
   - **JP 2007-140927**

2. **Priority**
   - **US 1999-452346**
     - **Priority**
       - **EP 1252803**
   - **Patent family**
     - **JP 4357781**
       - **Division application-1**
         - Invalidation lawsuit: application No. 2010-800083 (Apr. 28, 2010)
     - **Division application-2**
       - Invalidation lawsuit: application No. 2010-800084 (Apr. 28, 2010)
   - **JP 2009-140434**
     - (June 11, 2009)
     - **Division application-3**

3. **Priority**
   - **US 1999-311126**
     - **Priority**
       - **EP 1933395**
       - **EP 1449238**
   - **Patent family**
     - **JP 3992929**
       - **Division application**
         - Invalidation lawsuit: application No. 2010-800044 (Mar. 15, 2010)
         - Final rejection (Feb. 22, 2011)
   - **JP 2007-140927**

4. **Priority**
   - **US 1999-452346**
     - **Priority**
       - **EP 1252803**
   - **Patent family**
     - **JP 4357781**
       - **Division application-1**
         - Invalidation lawsuit: application No. 2010-800083 (Apr. 28, 2010)
     - **Division application-2**
       - Invalidation lawsuit: application No. 2010-800084 (Apr. 28, 2010)
   - **JP 2009-140434**
     - (June 11, 2009)
     - **Division application-3**

JP 2009-252135
(Nov. 02, 2009)
I. THE INVALIDATION LAWSUITS IN JAPAN

A. OUTLINE OF THE CASE AND GROUNDS FOR CHALLENGING JAPANESE PATENTS

<table>
<thead>
<tr>
<th>Table 4: Comparison of Japanese Patents and Prior Arts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Claim 1</strong></td>
</tr>
<tr>
<td>The Highly Efficient Organic Light Emitting Devices Based on Electric phosphorescence</td>
</tr>
<tr>
<td>An electroluminescent layer comprises an emissive layer containing an emissive phosphorescent organometallic iridium or phosphorescent organometallic osmium compound.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Prior Arts</strong></th>
<th><strong>JP 4357781/ JP 4358168</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>D1: Electroluminescence cell consists of an indium-tin oxide (ITO) substrate; an emitting layer of transition metal complexes such as ruthenium, osmium or iridium (ex. Os(CN)2(PPh3)X).</td>
<td>D1: Emissive Iridium Mono- and Bimetallic 1,3-Diketone Complexes</td>
</tr>
<tr>
<td>D2: Excited-state properties of a triply ortho-metalated iridium(III) complex</td>
<td>D2: Emissive Iridium(2-Phenylpyridine)2 (Acy tyl acetonate) Complex</td>
</tr>
<tr>
<td>D3: Facial tris cyclometalated rhodium(3+) and iridium(3+) complexes: their synthesis, structure, and optical spectroscopic properties.</td>
<td>D3: Complexes of Palladium(II), Iridium(III) and Ruthenium(II) (ex. 2-Phenylpyridine)2 Ir(NH2C(H) (R)CO2) Complex</td>
</tr>
<tr>
<td>Ir(ppy)3 as a phosphorescent emission layer material</td>
<td></td>
</tr>
</tbody>
</table>

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*Yuguang Ma, et al., Electroluminescence from Triplet Metal-Ligand Charge-Transfer Excited State of Transition Metal Complexes, 94 SYNTHETIC METALS, 245-248 (1998).*


*Mirco, G., et al., Facial Tris Cyclometalated Rhodium(3+) and Iridium(3+) Complexes: Their Synthesis, Structure, and Optical spectroscopic properties, 33 (3) INORGANIC CHEM, 545-550 (1994).*

*Peter, I. et al., Luminescent Rhodium and Iridium Mono- and Bimetallic 1,3-Diketone Complexes, 217 th ACS National Meeting, Abstract 292 (1999).*

*Dedeian, K. et al., A New Synthetic Route to The Preparation of a Series of Strong Photoreducing Agents: Fac-Tris-Ortho-Metalated Complexes of Iridium(III) with Substituted 2-Phenylpyridines, 30 INORGANIC CHEMISTRY, 1685-1687 (1991).*

*Reinhold Urban, et al., Metal complexes of biologically important ligands, LXXXVII α-amino carboxylate complexes of palladium(II), iridium(III) and ruthenium(II) from chloro-bridged ortho-metallated metal compounds and [OC]3Ru(Cl)(μ-Cl)2, 517 J. ORGANOMETALLIC CHEM. 191-200 (1996).*
Back in June 2011, UDC’s patents in Japan were invalidated and some family patents are also being challenged in Korea (by Duksan Hi-Metal) and in Europe.\(^\text{416}\)

UDC has a strong intellectual property portfolio of fundamental phosphorescent OLED (PHOLED) technologies and materials used for PHOLED displays and lighting devices, wielding great market power in OLED industry.\(^\text{417}\) Recently, three UDC PHOLED patents\(^\text{418}\) as shown in Fig. 17 were invalidated in Japan in March 2011 on the grounds that the broadest claims\(^\text{419}\) of fundamental patents were not valid in the challenging actions brought by Semiconductor Energy Laboratory (SEL).\(^\text{420}\)

According to the analysis of citation of patent family of UDC Japan patents, UDC shows significantly high self-reliance in the field of PHOLED material based on an OLED original patent of a high-efficient electroluminescent device.\(^\text{421}\) Furthermore, UDC has influenced the research and development of many companies including SEL, SDC and LG Electronics.\(^\text{422}\)

On 15 Mar. 2010, SEL filed an invalidation action with the Patent Trial Board of the JPO to challenge JP 3992929\(^\text{423}\) as shown in Fig. 17, in which this particular patent relates to UDC PHOLED technology and was granted way back in August 2007; on the grounds that it

\(^{416}\) OLED-info.com, supra note 8.  
\(^{417}\) Universal Display Corporation, supra note 2.  
\(^{418}\) Japanese Patents No. 4357781 B1, No. 4358168 B1, No. 3992929 B1.  
\(^{419}\) Supra text accompanying note 6.  
\(^{420}\) Supra text accompanying note 7.  
\(^{421}\) US 6097147 (Claim 1; A light emitting device including a pixel comprising: a substantially transparent anode; a hole transporting layer over said anode; an emission layer over said hole transporting layer; a blocking layer over said emission layer; an electron transporting layer over said blocking layer; and a cathode in electrical contact with said electron transporting layer).  
\(^{423}\) Claiming priority of US 1999-311126.
lacks novelty over prior arts D1, D2 or D3 (Article 29 (1)); on the grounds that it lacks an inventive step over prior arts D1, D2 or D3, or the combination of D1, D2 or D3 as shown in Table (Article 29 (2)); on the grounds that the invention cannot be easily worked since the technical terms used in the detailed specification of the invention are not harmonized (Article 36 (4)); and on the grounds that the subject matter of the opposed patent extends beyond the content of the application as filed (Article 36 (6)(1)).

In Feb. 16, 2011, the JPO issued a decision that confirmed the validity of JP 3992929, while finding that the broadest claims 1-3 were invalid. UDC subsequently filed an appeal with the Japanese High Court. The Japanese High Court acknowledged the validity of certain claimed inventions in the patent, but confirmed the JPO's conclusion invalidating the broadest claims 1-3. UDC appealed to the Japanese Supreme Court and the case is still pending as of this writing.

The JP 43357781 and JP 4358168 patents relating to UDC's L2MX technology claiming the priority of US 1999-452346 is also subject to invalidation trials at the Patent Trial Board of the JPO initiated on Apr. 28, 2010; on the grounds that it lacks novelty over prior arts D1, D2 or D3; on the grounds that it lacks inventive step over prior arts D1, D2 or D3, or combination of D1, D2 or D3 as shown in Table; on the grounds that an invention

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424 Article 29(1) of the Japanese Patent Act (2008) (“In order to fulfill conditions of novelty, the invention must neither be publicly known in Japan or a foreign country prior to the filing of the patent application, nor be described in a distributed publication in Japan or a foreign country prior to the filing of the patent application”).
427 Id.
428 Id.
429 Id.
cannot be easily manufactured since the technical terms used in the detailed specification of the invention are not harmonized; and on the ground that the subject matter of the opposed patent extends beyond the content of the application as filed.

Regarding JP 43357781 and JP 4358168 patents, the JPO issued a decision that all claims of inventions are invalid, but the Japanese High Court reversed the decision of the trial court. Continuously, SEL appealed to the Japanese Supreme Court and the case is still pending as of this writing.

II. THE INVALIDATION LAWSUITS IN KOREA

Duksan Hi-Metal, a Korean OLED materials manufacturer, has been providing both fluorescent blue and fluorescent green OLED materials to SDC. UDC’s patent position has prevented Duksan from manufacturing phosphorescent OLED materials which have been supplied to SDC for OLED panel manufacturing, since the opposed patents of UDC claimed too broad scope of compounds. In the suit brought by Duksan Hi-Metal, which competes with UDC in material sales and is also a SDC supplier, it has a vested interest in not losing its SDC business to UDC.

Just after two of UDC’s PHOLED patents were invalidated by a Japanese court, on May 2011 Duksan Hi-Metal filed its own action before the Korea Intellectual Property

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430 The Osadirect Newsletter, Universal Display enters in to service and production agreement with Duksan Hi Metal in South Korea, (24 September 2012), available at http://www.osa-direct.com/osad-news/universal-display-enters-in-to-service-and-production-agreement-with-duksan-hi-metal-in-south-korea.html. (“Duksan Hi-Metal is a global leader in developing and distributing organic light emitting device (OLED) technologies and services…founded in 1999…Duksan Hi-Metal supplies OLED materials (HTL and HIL) to Samsung Display AMOLED material accounted for half of its total revenue in 2011”).

431 Kim, supra note 111.
Tribunal challenging five of UDC’s PHOLED patents such as KR 0744199, KR 0913568, KR 0937470, KR 0840637, KR 0794975 claiming the priority of US 1999-311126, and KR 0999-452346. In the lawsuits, it was alleged that UDC is not the first user of phosphorescent OLED materials commercially and those have been used in this relevant market before UDC filed application of the patents.

Duksan Hi-Metal demanded the invalidation of the five Korean patents on the grounds that they lack novelty and an inventive step under the terms of Article 29(1) and 29(2) of the Patent Act, respectively; and on the grounds that they violate Article 42(3), Article 42(4)(2), and Article 42(4)(1) of the Patent Act.

The company, however, withdrew all pending invalidation lawsuits on Sep. 2012 to reconcile the dispute, pursuing cooperation between UDC and Duksan Hi-Metal as win-win strategies.

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437 Case cited supra note 432.
438 Patent Examination Guideline, supra note 340 and accompanying text.
439 Patent Examination Guideline, supra note 299 and accompanying text.
440 Patent Examination Guideline (2013) (“Where an invention cannot be easily worked since the technical terms used in the detailed specification of the invention are not harmonized, an examiner shall notify a ground for rejection citing the violation of Article 42(3) of the Patent Act”).
441 Patent Examination Guideline (2013) (“Article 42(4)(2) of the Patent Act (Requirements for Patent Registration) When a patent right is granted to an invention whose description in claims is unclear or concise, a parent application cannot serve its role as the abstract of title which determines the scope of protection of the claimed invention because of the unclear protection scope of the invention”).
442 Patent Examination Guideline (2013) (“Article 42(4)(1) of the Patent Act (Requirements for Patent Registration) The claim(s) must be supported by a detailed explanation of the invention; It applies when the claimed invention is not disclosed in the detailed description of the invention or is out of scope of the detailed description of the invention that a person skilled in the art easily recognizes”).
443 Case cited supra note 432.
444 The Osadirect Newsletter, supra note 430.
III. THE INVALIDATION LAWSUITS IN EUROPE

Seeking similar actions in Europe, each of the plaintiffs such as Sumitomo Chemical Company, Merck Patent GmbH and BASF SE requested the revocation of the European Patent EP 1 252 803\(^{445}\) (grant published Oct. 13, 2010) in its entirety, which is the counterpart patent to JP 43357781 and JP 4358168.\(^{446}\)

The three plaintiffs opposed the patent EP 1 252 803 in the Opposition Division of the EPO on July 2011; on the grounds that it lacks novelty (Articles 100(a) EPC)\(^{447}\) and an inventive step (Article 54(3)\(^{448}\) and 56\(^{449}\) EPC), respectively; on the grounds that it does not disclose the invention clearly enough for the skilled man to carry it out (Article 100(b) EPC)\(^{450}\); and on the ground that the subject matter of the opposed patent extends beyond the content of the application as filed (Article 100(c) EPC).\(^{451},\ 452\)

In Feb. 2012, the Patentee requested that the opposition be dismissed and the patent maintained as granted. The Opposition Division came to the conclusion that the main request did not fulfill the requirements of Article 123(2) EPC\(^{453}\) and the patent should be maintained.

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\(^{446}\) The European Patent Convention: Article 100 Grounds for Opposition; Opposition may only be filed on the grounds that: (c) the subject-matter of the European patent extends beyond the content of the application as filed, or, if the patent was granted on a divisional application or on a new application filed under Article 61 (European patent applications filed by non-entitled persons), beyond the content of the earlier application as filed.

\(^{447}\) The European Patent Convention, supra note 318 and accompanying text.

\(^{448}\) The European Patent Convention, supra note 309 and accompanying text.

\(^{449}\) The European Patent Convention, supra note 185 and accompanying text.

\(^{450}\) The European Patent Convention, supra note 320 and accompanying text.

\(^{451}\) The European Patent Convention, supra note 446 and accompanying text.

\(^{452}\) Id.

\(^{453}\) The European Patent Convention: Article 123 Amendments; (2) The European patent application or European patent may not be amended in such a way that it contains subject-matter which extends beyond the content of the application as filed.
in amended form which satisfied the requirements of EPC, taking into account the amendments made by the Patentee in Dec. 2012.454

Upon upholding UDC’s claims on iridium emitters, the plaintiffs appealed to the Boards of Appeal of the EPO against the decision in Feb. 2013, requesting that the decision of the Opposition Division should be set aside, and the patent should be revoked in its entirety. This case is pending as of this writing.455

Similarly, the three plaintiffs requested the revocation of the European Patent EP 1 449 238 which is the counterpart patent to JP 3992929 (granted on Oct. 6, 2006), in its entirety with the Opposition Division of the EPO in Mar. 2007, claiming the priority of US 1999-311126. In an oral proceeding of the EPO, key claims have been invalidated and revoked. Then UDC submitted a much narrower patent deleting any references to any phosphorescent materials other than iridium, where “a phosphorescent organometallic osmium compound” has been deleted in independent claims and “the cyclometallated organometallic iridium compounds” were limited to compounds with aromatic ligands in claim 1. This amendment is supported by the description of the application documents as filed.456

On Jan. 2012, The Opposition Division found that the main request did not fulfill the requirements of Article 123(2) EPC457 and UDC’s claims on iridium emitters in the patent satisfied the requirements of EPC.458 On Mar. 2012, the opponents appealed to the Boards of

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454 Case cited supra note 445.
455 Case T-0323/13, Sumitomo Chemical Co./Merck/BASF v. Universal Display Corporation, the Technical Board of Appeal of the EPO (2013).
457 The European Patent Convention, supra note 453 and accompanying text.
458 Case cited supra note 456.
Appeal of the EPO against the decision in Feb. 2013, requesting that the decision of the Opposition Division be set aside, and the patent be revoked in its entirety. This case is pending as of this writing.459

Likewise, as to another European Patent EP 1933395, one of the family patents claiming the priority of US 1999-311126, the three plaintiffs requested the revocation of the European Patent EP 1933395 (granted Apr. 29, 2011) in its entirety with the Opposition Division in EPO on Feb. 2012. In an oral proceeding of the EPO, key claims have been invalidated and revoked. Then UDC submitted a much narrower patent deleting any references to any phosphorescent materials other than iridium, where “a phosphorescent organometallic osmium compound” has been deleted in independent claims and “the cyclometallated organometallic iridium compounds” were limited to compounds with aromatic ligands in claim 1. This amendment is supported by the description of the application documents as filed.460

In Dec. 2013, the Opposition Division found that the Main Request did not fulfill the requirements of Article 123(2) EPC461 and UDC’s claims on iridium emitters of the patent satisfied the requirements of EPC.462

459 Case T-0544/12-3.4.03, Sumitomo Chemical Co./Merck/BASF v. Universal Display Corporation, the Technical Board of Appeal of the EPO (filed 2012).
461 The European Patent Convention, supra note 453 and accompanying text.
462 Case cited supra note 460.
IV. SUMMARY AND DISCUSSION

Even though UDC announced that the three invalidated patents are not fundamental patents, and the basic PHOLED patent is still valid and enforceable until 2018 in Japan, the decision shall affect OLED market products being made, used and sold in Japan.463

The Japanese court decision, however, significantly favors other competitive material firms and Korean OLED panel manufacturers such as SDC and LGD since the broadly claimed patents at issue has been a stumbling block for them in their attempts to preempt the global market, and the phosphorescent OLED materials have been mostly traded in Japan.464

Because of the UDC patents at issue, other competitors like material manufactures have been limited in developing high-quality phosphorescent materials while escaping patent liability and this difficulty has increased the market price of materials.465

Although licensees of UDC has been paying millions of dollars to UDC annually, as a result of this case, they may not have to pay royalties for using these materials since the trade and use of the phosphorescent materials take place mostly in Japan.466 The decisions in the Japanese High Court are still under appeal in the Japanese Supreme Court, so the ultimate outcome is still unknown.

SDC (a panel manufacturer dominating 99.5 percent of the global OLED panel market share),467 UDC's largest customer, was willingly expecting that Duksan Hi-Metal (a supplier to SDC) would win this action since the invalidation of relevant patents would open

463 Universal Display Corporation, supra note 2.
464 Kim, supra note 111.
465 Id.
466 Id.
467 Guangzhou Etoplink Co. LTD, supra note 82.
the door for Korean materials makers to tap into the premium OLED materials market and also help the AMOLED materials market grow faster.\textsuperscript{468}

If the relevant patents were invalidated like in the Japanese cases, then the legal challenge by Duksan Hi-Metal to patents of PHOLED materials could potentially accelerate the entrance of Korean material firms in the OLED market resulting in development of advanced AMOLED (Active-matrix OLED) technology allowing for bright and energy efficient screens for cell phone and large scale televisions for OLED panel makers.\textsuperscript{469}

Duksan Hi-Metal, however, withdrew all pending invalidation lawsuit cases in 2012, and the two companies entered into an agreement to dismiss all pending patent invalidation lawsuits in Korea. According to the announcement, they expect mutual benefits and “substantial synergy effects” between them by collaboration of two companies’ mass-production experience and technical knowledge. Indeed, Duksan has constructed “OLED manufacturing facility to produce cost-effective OLED products” “as a leading Korean manufacturer of electronic materials for the OLED industry.” In the agreement, Duksan is supposed to provide “UDC’s one host product for certain Korean customers,” while UDC seeks to support the growing Korean OLED industry with expectation of that this new relationship will enhance UDC’s high-performance products and expand “OLED manufacturing infrastructure” in Korea.\textsuperscript{470}

Virtually, even though this withdrawal of invalidation lawsuits in Korea (2012) and the invalidation of the three UDC patents in Japan (2011), the collaborative bonding between SDC and UDC has been continued since 2011 targeting a stable and continuous supply of

\textsuperscript{468} Kim, supra note 111. 
\textsuperscript{469} Id. 
\textsuperscript{470} The Osadirect Newsletter, supra note 430.
UDC PHOLED materials and the development of OLED materials. Moreover, SDC “recently renewed its license of UDC technology” for commercializing new products using UDC blue materials.\footnote{Nanomarkets.net, supra note 87.}

That collaboration might be an inevitable result as 59% of UDC revenue comes from panel manufactures in Korea. Therefore, UDC would be much more concerned with developments in Korea through a long-term contract with panel manufactures than in Japan.\footnote{Evan Niu, Universal Display Faces Another Patent Scare, The Motley Fool (May 17, 2012), available at http://www.fool.com/investing/high-growth/2012/05/17/universal-display-faces-another-patent-scare.aspx.}

This settlement of invalidation proceedings implies that invalidation lawsuits take place all over the world but, nevertheless, the invalidation decisions might not have a “material adverse impact on the UDC’s global portfolio of patents and pending applications or the ability to pursue licensing and material sales business opportunities.”\footnote{Id.}

For now, the three Japanese patents are, however, still up to the courts to decide. Since all of these patents are related to European counterparts and European invalidation trials, it is anticipated that a finalized invalidation would have negative implications for UDC since already “UDC's shares are dropping around 10%” after the invalidation of the three UDC patents in Japan (2011).\footnote{Oled-Info.com, Japan's High Court Invalidates Claims in UDC's Patents, Shares Drop (May 17, 2012), available at www.oled-info.com/japans-high-court-invalidates-claims-udcs-patents-shares-drop.}

The decision of the Opposition Division of the EPO for EP 1 449 238 and EP 1 933 395 makes it clear that UDC’s patents are too broadly claimed, so it cannot claim patent
“rights over non-iridium cores” any more. When such non-iridium cores appear in the market after development, the strength of UDC’s patents may be seriously weakened.\textsuperscript{475}

Those blocking patents with broad claims at issue have been preventing other competitors like material manufactures from developing high-quality phosphorescent materials while escaping patent liability and this difficulty has increased the market price of materials.

This resulted in the panel manufacturers having to choose between lower quality alternative materials or expensive materials of UDC patented materials to make OLED panels. It caused harm to both consumer and competitors.

\textsuperscript{475} Nanomarkets, supra note 77.
Chapter Six  APPLICATION OF PATENT MISUSE AND ANTITRUST LAW TO PATENT STRATEGIES AND PATENT DISPUTES IN OLED DISPLAY INDUSTRY

I. INTRODUCTION OF ANTITRUST LAW AND PATENT MISUSE

A. RELATIONSHIP BETWEEN OF ANTITRUST LAW AND PATENT RIGHT PROTECTION

The patent rights ensures the exclusive and monopoly right to the inventor to encourage and promote invention in return for the publication of the invention to public so that consumers utilize the invention, thereby improving and developing technology, and contributing the development of industry and consumer’s welfare.

The reason why patent rights are restricted to the scope of the claims, to period, and to effect, is so as to balance the cost on the public and benefits by distribution of the invention.\(^\text{476}\)

The antitrust law contravenes anticompetitive agreement, monopolization or attempted monopolization in order to promote innovation and consumer’s welfare. Conceptually, antitrust law seems to be incompatible with patent law. That is to say, while monopolies in legitimate periods or exclusive rights which allow the patent holder product distinction and sometimes authority on price are conferred by patent rights in order to promote innovative research and development, antitrust law encourage competition through controlling the regularity and extent of monopolies.\(^\text{477}\)

\(^{476}\) HOVENKAMP, ET AL., supra note 13.

\(^{477}\) Id.
The distinction between the “exclusive right” and the “economic monopoly” power is the concern of antitrust law that does not make monopoly itself illegal, but prohibits the anticompetitive conducts intended to obtain “market power.”\textsuperscript{478}

For examples, a patent holder’s action to monopolize the market by disturbing competition beyond the scope of patent rights may constitute the violation of antitrust law.\textsuperscript{479}

In contrast, if the owner who tries to get and maintain a monopoly without anticompetitive conducts to control the market power, will not automatically violate antitrust law.\textsuperscript{480} Antitrust law and patent rights, however, possess “common economic goals”, maximizing consumer’s welfare “by producing what consumers want at the lowest cost.”\textsuperscript{481}

While patent law and antitrust law systems are enforced in different way: “patent law encourages innovation by granting exclusionary rights to innovators, whereas antitrust law facilitates innovation by encouraging competitors to innovate to take sales away from competitor in a free market,” patent law and antitrust law systems commonly encourage innovation by prohibiting misconducts that may harm innovation.\textsuperscript{482}

\textsuperscript{478} HOVENKAMP, ET AL., supra note 13, at 1-11. “Market power” is the capability of a firm to set the price or supply of a product to make profits. As another definition, “market power is the power to profit by charging more than marginal cost, which is the competitive price for a good or service. In order to raise a price above the competitive level, a firm must be able to reduce market-wide output, which it does by reducing its own output while rivals are unable to make compensating increase in output...An important goal of antitrust policy is minimizing the amount of market power in the economy, particularly when this power is undesirable in that it does not represent the rewards of innovation or other superiority.” Id. at 4-2, 4-3.

\textsuperscript{479} HOVENKAMP, ET AL., supra note 13, at 1-11.

\textsuperscript{480} Id.

\textsuperscript{481} Id. at 1-12.

\textsuperscript{482} Leslie, supra note 15, at 1286; THE U.S. DEP’T JUST. AND THE FED. TRADE COMMISSION, Antitrust Guidelines for the Licensing of Intellectual Property 2 (April 6, 1995), available at http://www.justice.gov/atr/public/guidelines/0558.pdf (“[T]he intellectual property laws and the antitrust laws share the common purpose of promoting innovation and enhancing consumer welfare...The antitrust laws promote innovation and consumer welfare by prohibiting certain actions that may harm competition with respect to either existing or new ways of serving consumers”) (citing Atari Games Corp. v. Nintendo of America, Inc., 897 F.2d 1572, 1576 (Fed. Cir. 1990) (“[T]he aims and objectives of patent and antitrust laws may seem, at first glance, wholly at odds. However, the two bodies of law are actually complementary, as both are aimed at encouraging innovation, industry and competition”)).
B. ANTITRUST LAW IN US

In 1890, United States Congress enacted “Sherman Anti-trust Act” which describes any law intended to enhance competition. Including the Sherman Act, the Federal Antitrust Laws contains the Clayton Act, the Robinson Patman Act and the Federal Trade Commission Act.\textsuperscript{483} The Sherman Act consists of two provisions. Section 1 of the Sherman Act proscribes any agreement which causes unreasonable restraints of trade.\textsuperscript{484} Section two of the Sherman Act deals with unilateral monopolization seeking to obtain or uphold monopoly power in a relevant market.\textsuperscript{485} The Sherman Act, in recent times, is interpreted as promoting consumer’s welfare and protecting competition, not competitors.\textsuperscript{486}

1. Section 1 of the Sherman Act

Section 1 of the Sherman Act provides that every 1) “agreement” or “concerted action” such as “contract, combination or conspiracy”, \textsuperscript{487} 2) which constitutes “unreasonable restraint of trade” causing an “unreasonably anticompetitive effect”; and 3) that has an effect on interstate commerce, shall be prohibited.\textsuperscript{488}

\textsuperscript{484} CHRISTOPHER R. LESLIE, ANTITRUST LAW AND INTELLECTUAL PROPERTY RIGHTS 25 (Oxford, 2011).
\textsuperscript{485} Id.
\textsuperscript{486} Id. at 250 (quoting United States v. Mocrosoft Corp., 253 F.3d 34, 58 (D.C.Cir.2001)).
\textsuperscript{487} To establish the violation of Section 1, the agreement should be made in writing, oral or conduct with intent that adversely affect competition. If the agreement gives an adverse impact on a competitor, the activity can be charged with criminal liability. George A. Hay, Horizontal Agreements: Concept and Proof, 51 ANTITRUST BULL. 878-882 (2006).
Two kinds of agreements exist under Section 1 of the Sherman Act. “Horizontal” agreements are formed between competitors, and “vertical” agreements are made in the relationship between a seller and its customers. Horizontal agreements are much more likely to be illegal per se than vertical agreements. A horizontal agreement can be made even if competitors have no contact with each other.

Those agreements are legally evaluated in the per se rule, the rule of reason or quick look analysis. For per se illegal horizontal agreements, there are agreements on specific prices, increasing prices, limiting discounts, affecting quality, making a courtesy bid, division of markets, no bidding, and allocation of customers.

The conduct of an attempt to reach illegal agreement is not condemned in Section 1, so likewise, soliciting an unlawful agreement does not contravention of Section 1, but instead may constitute a violation of Section 2 as attempted monopolization.

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491 HOVENKAMP, ET AL., supra note 13, at 20-17; Hay, supra note 487, at 877.
492 HOVENKAMP, ET AL., supra note 13, at 20-17; Hay, supra note 487, at 877.
493 When any agreement included in a per se category, the agreement constitutes a violation of Section 1. Such the per se illegal agreement is apparently anticompetitive, so it always “restrict competition and decease output”, and any further assessment is not needed to prove the anticompetitive effect. LESLIE, supra note 484, at 26; See Northwest Wholesale Stationers, Inc. v. Pacific Stationery & Printing Co., 472 U.S. 284, 289-90 (1985).
494 LESLIE, supra note 484, at 26 (Under the rule of reason, the plaintiff takes burden of proof, so the plaintiff must establish that the agreement adversely affect fair competition by anticompetitive conducts. In a court, a court considers several factors “including specific information about the relevant business, its condition before and after the restraint was imposed, and the restraint’s history, nature, and effect.” quoting State Oil Co. v. kham, 522 U.S. 3, 10 (1997)).
495 LESLIE, supra note 484, at 27 (In case of antitrust violation by non-profit organization, the court may use quick look analysis if “observer with even a rudimentary understanding of economics could conclude that the arrangements in question would have an anticompetitive effect on customers and markets.” quoting California Dental Ass’n v. FTC, 526 U.S. 756 (1999)).
2. Section 2 of the Sherman Act

Section 2 of the Sherman Act provides that “every person who shall monopolize, or attempted to monopolize, or combine or conspire with any other person or persons, to monopolize any part of the trade or commerce among the several States, or with foreign nations, shall be deemed guilty of a felony.” The Section 2 of the Sherman Act proscribes three offenses like “Monopolization,” “Attempted Monopolization” and “Conspiracies to Monopolize.” All offenses require a “relevant market” and have its own elements which a plaintiff should prove to claim liability.

1-1. Monopolization

To constitute the offense of monopolization under Section 2 of the Sherman Act, following two elements should be satisfied: “(1) the possession of monopoly power in the relevant market and (2) the willful acquisition or maintenance of that power as distinguished from growth or development as a consequence of a superior product, business acumen, or historic accident” (“monopoly conduct requirement”). The monopoly power can be estimated by the defendant’s market share in the relevant market. The plaintiff should prove that the defendant possesses monopoly power in the “antitrust market” which should be properly defined through the demarcation of the relevant product market and the relevant

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499 LESLIE, supra note 484, at 28.
500 The ability of a single firm to control price entirely on its own and raise prices without losing business to others.
502 LESLIE, supra note 484, at 29 (“courts have not articulated a uniform market share that marks the threshold between monopoly power and a lack thereof”…“some courts are willing to find monopoly power if a defendant has a market share of about 75% or higher. Conversely, in most cases if the defendant has a market share of 50% or lower, this is generally insufficient to establish monopoly power”).
503 Id. at 28.
geographic market. The second element contains “monopoly conduct, anti-competitive conduct, predatory conduct, and exclusionary conduct” according to Section Two jurisprudence. Among them, the exclusionary conduct was defined as the behavior that “impairs the opportunities of rivals; does not further competition on the merits; or does competition in an unnecessarily restrictive way.” Even though monopolist obtained the monopoly power by legitimate process of intellectual property right, if the rights are engaged in “illegal anticompetitive conduct”, the rights owner is not free from “antitrust liability.”

1-2. Attempted Monopolization

The Supreme Court decided that “to demonstrate attempted monopolization a plaintiff must prove (1) that the defendant has engaged in predatory or anticompetitive conduct with (2) a specific intent to monopolize and (3) a dangerous probability of achieving monopoly power.” To prove the third prong, the plaintiff needs to “define the relevant product and geographic markets” and to show that “the defendant’s anti-competitive conduct” cause a “dangerous probability” of the defendant acquiring monopoly power in this market.

1-3. Conspiracies to Monopolization

To claim a conspiracy to monopolization, “the plaintiff must prove: ‘(1) an agreement to restrain trade, (2) deliberately entered into with the specific intent of achieving a monopoly

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504 Id. at 28.
505 Id. at 31.
506 Id. at 31.
507 Id. at 31.
508 Id. at 31 (quoting Spectrum Sports, Inc. v. Macquillan, 506 U.S. 447, 456 (1993)).
509 LESLIE, supra note 484, at 32 (“The Market share requirement for attempted monopolization is lower...around 35 percent or higher depending on the presence of barriers to entry”).
510 Id. at 31.
rather than a legitimate business purpose, (3) which could have had an anticompetitive effect, and (4) the commission of at least one overt act in furtherance of the conspiracy.’”

3. Clayton Act

According to Section 3 of the Clayton Act, “tying arrangement” which can be constituted when a seller who possesses the market power in the “tying product” market forces a buyer to buy “tied product” to get “tying product,” shall be illegal since that kind of conduct disturbs fair competition and generates a monopoly in the relevant market. To enforce the violation of the Section 3 of the Clayton Act, the plaintiff should prove “involvement of a ‘not insubstantial’ amount of interstate commerce in the market of the tied product” as well as the relevant fact patterns of tying arrangement as defined above.

The Clayton Act differs from the Sherman Act in that the Clayton Act considers only product, but on the other hand, the Sherman Act deals with “services” also.

4. Federal Trade Commission Act

In 1914, Congress dealt with the “deficiencies of judicial interpretation of the Sherman Act.” Eventually, Congress passed the Federal Trade Commission Act, which established the Federal Trade Commission (“FTC”) and gave it authorization to enforce the

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511 Id. at 32 (quoting U.S. Anchor mfg., Inc. v. Rule Indus., Inc., 7 F.3d 986, 998 (11th Cir. 1993)).
512 15 U.S.C. §14; LESLIE, supra note 484, at 33 (quoting Eastman Kodak Co. v. Image Technical Services, Inc., 504 U.D. 451, 461 (1992) (“A tying arrangement is ‘an agreement by a party to sell one product but only on the condition that the buyer also purchases different (or tied) product, or at least agrees that he will not purchase that product from any other supplier’”)).
514 LESLIE, supra note 484, at 33.
515 Id. at 35.
FTCA provisions, Section 5.\textsuperscript{516} The Section 5 is for a remedy and punishment of “unfair methods of competition in or affecting commerce and unfair or deceptive acts or practices in or affecting commerce.”\textsuperscript{517} Using this power, the FTC can bring actions involving violations of the antitrust laws as well as actions against conduct deemed merely unfair or deceptive. “Much conduct that violates the Sherman Act or Clayton Acts” shall constitute necessarily the violation of Section 5 of the FTCA.\textsuperscript{518} It, however, is much broader, so it prohibits “deceptive trade practices” even though the conduct does not restrain competition as in Antitrust Law.\textsuperscript{519} The main difference between the FTCA and the Sherman and Clayton Acts, the FTCA is only applied to government action.\textsuperscript{520} The FTCA authorizes the FTC to “hit at every trade practice…which restrain[s] competition or might lead to such restraint if not stopped in its incipient stages.”\textsuperscript{521}

C. RELATIONSHIP BETWEEN ANTITRUST LAW AND DOCTRINE OF PATENT MISUSE

The doctrine of patent misuse forbids patentees from leveraging exclusive and monopoly patent rights through certain conduct that is “inconsistent with goals and policies underlying patent law” as an equitable defense.\textsuperscript{522} The doctrine of patent misuse is a broader concept than antitrust law.\textsuperscript{523} While an antitrust law violation relating a patent falls into

\begin{itemize}
\item \textsuperscript{516} Id.
\item \textsuperscript{517} Id. (citing 15 U.S.C. § 45(a)(1)).
\item \textsuperscript{518} LESLIE, supra note 484, at 35.
\item \textsuperscript{519} Id.
\item \textsuperscript{520} Id.
\item \textsuperscript{521} Id. (citing FTC v. Cement Institute, 333 U.S. 683, 693 (1948)).
\end{itemize}
patent misuse, patent misuse can be constituted without an antitrust law violation.\textsuperscript{524} The doctrine of patent misuse exists for the balance between the concept of the patent rights as an “absolute property right” with the theory that the patent rights should be enforced complying with the “public policies underlying its grant.”\textsuperscript{525}

In terms of the purpose of the two notions, the doctrine of patent misuse pursues preventing the extension of the monopoly power from the patent rights, whereas an antitrust law focuses on the anticompetitive behavior.\textsuperscript{526}

In reality, the patent misuse has played a role as an “affirmative defense” against an attack of patent infringement when the action abuses his patent rights by extending them beyond the original scope of its grant,\textsuperscript{527} whereas antitrust law has served as a counterattack in the litigation for the “recovery of treble damages under the Clayton Act as the cause of independent litigation.”\textsuperscript{528} The doctrine of patent misuse is based on the common law

\textsuperscript{524} Id. at 671 (citing Alan J. Weinschel and Robert P. Stefanski, \textit{Antitrust and Patent Misuse in Licensing: Part I,} 7 (11) J. PROPRIETARY RTS. 18, 18 (1995)); Around Princo Corp. v. International Trade Commission case, the relationship between Antitrust Law and Doctrine of Patent Misuse have been under dispute. See Zain, supra note 522, at 95-96 (“The Federal Circuit’s Princo decision is not only inconsistent with Supreme Court precedent, but also substantially hinders the policy goals of preventing inequitable, abusive, and anticompetitive conduct by patent holders. Rather than weakening it, the Federal Circuit should focus on creating a better-defined, vigorous misuse doctrine, independent of antitrust principles, to uphold these worthy goals…misuse is often pled alongside an antitrust counterclaim, the two doctrines have become somewhat conjoined…consequently, some have argued that misuse has become superfluous and should be subsumed by antitrust law, or even abandoned entirely”).

\textsuperscript{525} White, supra note 523, at 672 (citing Hensley Equip. Co., Inc. v. Esco Corp., 383 F.2d 252, 260 (5th Cir. 1967) (stating that “[t]he rationale of the doctrine is a rejection of the concept of the patent as an absolute property right in favor of its definition as a right which must not be exercised in a manner not consistent with the constitutionally-defined purpose for which it was conferred, i.e., to ‘promote the Progress of the useful Arts.’”) (quoting U.S. CONST. art. I, §8)).

\textsuperscript{526} White, supra note 523, at 672 (citing DONALD CHISUM, CHISUM PATENTS, § 19.04 [2], at 19-44-46, (2000) (explaining that “[a]ntitrust analysis involves a balancing of patent interests and the impact or likely impact of a practice on competition. The misuse doctrine compounds the difficulty of balancing by substituting for competitive injury the vague concept of “extension”)).


\textsuperscript{528} White, supra note 523, at 672 (citing 15 U.S.C. § 14 (1982)).
doctrine of “unclean hands”\footnote{Chu, supra note 527, at 1356 (“essentially prevents any party with unclean hands from recovering damages in a patent infringement suit, even when the patent is truly infringed”).} and public policy\footnote{Id. (citing Morton Salt Co. v. G.S. Suppiger Co., 314 U.S. 488, 492 (1942) (“[T]he public policy which includes inventions within the granted monopoly excludes from it all that is not embraced in the invention. It equally forbids the use of the patent to secure an exclusive right or limited monopoly not granted by the Patent Office and which is contrary to public policy to grant”).) underlying patent law which is designed to “grant exclusive rights to a new and nonobvious invention for a limited time in exchange for its disclosure to the public.”\footnote{White, supra note 523, at 673 (citing Rite Hite Corp. v. Kelley Co., 56 F.3d 1538, 1547 (Fed. Cir. 1995) (reasoning that “[a] patent is granted exchange for a patentee’s disclosure of an invention, not for the patentee’s use of the invention. There is no requirement in this country that a patentee make, use or sell its patented invention”).).} Such disclosure is supposed to “encourage and facilitate competition in the market” during the patent term and even after it expires.\footnote{White, supra note 523, at 673 (citing Image Technical Servs., Inc. v. Eastman Kodak Co., 125 F.3d 1195, 1214-15 (9th Cir. 1997) (stating that “[p]atent laws reward to inventor with the power to exclude others from making, using or selling [a patented invention]…[m]eanwhile, the public benefits both from the faster introduction of inventions and the resulting increase in competition”).} 

Statutory reference to patent misuse appears in “§ 271(d) of the Patent Act which limits the doctrine of misuse by excluding certain kinds of behavior. The relevant portion of the statute states:”\footnote{Chu, supra note 527.}

\begin{itemize}
  \item[(d)] No patent owner otherwise entitled to relief for infringement or contributory infringement of a patent shall be denied relief or deemed guilty of misuse or illegal extension of the patent right by reason of his having done one or more of the following: . . . (3) sought to enforce his patent rights against infringement or contributory infringement; (4) refused to license or use any rights to the patent; or (5) conditioned the license of any rights to the patent or the sale of the patented product on the acquisition of a license to rights in another patent or purchase of a separate product, unless, in view of the circumstances, the patent owner has market power in the relevant market for
the patent or patented product on which the license or sale is conditioned.\textsuperscript{534}

If the section 271(d)(3) would be modified to “expressly eliminate predatory patent infringement suits from the exception to misuse, instead of broadly stating that any action to enforce patent rights is exempt, a model subsection would exempt only situations in which a plaintiff”\textsuperscript{535}

(3) Sought to enforce his patent rights against infringement or contributory infringement, unless, in view of the circumstances, the patent owner is enforcing his patent in bad faith, or he intends to unfairly control a portion of the relevant market for the patent and has the requisite power in the market to make this control possible.\textsuperscript{536}

With the modification, courts would interpret the “bad faith,” “unfair” and “power” to match the factors related in a Sherman Act antitrust analysis.\textsuperscript{537} Therefore, the subsection articulates “the way for misuse violations and antitrust damages for predatory suits.”\textsuperscript{538}

\textbf{D. COMPARATIVE STUDY OF US AND EU APPROACHES TO ANTITRUST LAW}

In this section, similarity and difference in Antitrust Law between US and EU will be discussed.


\textsuperscript{535} Chu, supra note 527, at 1367.

\textsuperscript{536} Id. (quoting Handgards, Inc. v. Ethicon, Inc., 552 F. Supp. 820 (N.D. Cal. 1982) (Handgards II lower court opinion), aff’d, 743 F.2d 1282 (9th Cir. 1984), cert. denied, 469 U.S.1190 (1985); Handgards I, 601 F.2d 986; Ethicon, Inc. v. Handgards, Inc. 432 F.2d 438 (9th Cir. 1970), cert. denied, 402 U.S. 929 (1971)).

\textsuperscript{537} Chu, supra note 527, at 1367.

\textsuperscript{538} Id.
“Article 82 of the EC Treaty539 and Section 2 of the Sherman Act” commonly contravene unilateral anticompetitive conduct impairing trade by dominant firms possessing market power.540

A big difference between them lies in that the conduct to achieve a “dominant position” by any means and strategies is not prohibited as “unilateral abuses” in the European competition laws. Instead, the abuses of the dominant position constitute the violation of Article 82.541 That is to say, “Section 2 of the Sherman Act is designed to protect competition by prohibiting the acquisition or maintenance of monopoly power, whereas Article 82 is used to regulate the actions of companies in dominant position.”542 The Contrary to the Section 2 of the Sherman Act, “Article 82 does not distinguish between monopolization and attempt to monopolization.”543 Only companies possessing dominant power “at the time when the alleged abuse” happened are subject to the violation of the Article 82.544

539 Article 82 of the EC Treaty (Dec. 05, 2008):
Any abuse by one or more undertakings of a dominant position within the common market or in a substantial part of it shall be prohibited as incompatible with the common market insofar as it may affect trade between Member States. Such abuse may, in particular, consist in:

(a) directly or indirectly imposing unfair purchase or selling prices or other unfair trading conditions; (b) limiting production, markets or technical development to the prejudice of consumers; (c) applying dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage; (d) making the conclusion of contracts subject to acceptance by the other parties of supplementary obligations which, by their nature or according to commercial usage, have no connection with the subject of such contracts.

541 Arezzo, supra note 540, at 465.
542 CZAPACKA, supra note 540, at 4.
543 Id. at 6.
544 Id. (Edward Elgar Publishing Limited, 2009) (“Yet, it appears that companies can be charged with an abuse of dominance when they have less market power than would be required for monopolization under Section 2 of the Sherman Act. In United Brands, a market share between 40 and 45 percent was sufficient to establish dominance”).
The Second difference would be found in that an “intent” factor of unilateral abuses is not assessed in European Commission except that “proof of intent has only been taken into account in a predatory pricing case.” By contrast, the Sherman Act weights great emphasis on “intent” to prove predatory and anticompetitive conducts.

Another difference is that in “the assessment of abuse and monopolization,” the defense against the liability of the EC can be an assertion that “it has been forced to undertake such behavior in order to minimize the losses it would suffer from rivals' competition” or possibly, dominant firms’ conduct produce efficiencies, “provided, however, that the purpose of such behavior is not to strengthen this dominant position and abuse it.” Conversely, under American antitrust law, dominant firms can defend themselves by simply asserting that their conduct gives efficiencies for consumers and “does not have the ultimate effect of harming consumers.” As to European competition bodies, “consumers’ welfare” have been considered as a goal of competition policy, but they also equally weigh the “protection and safeguard of competitive structures of markets.”

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545 Arezzo, supra note 540, at 465-466.
546 Id.
547 Arezzo, supra note 540, at 466-467 (“the European defense based on efficiency seems reasonably narrower in scope than its American counterpart.” Id. at 467. “European Commission in its Discussion Paper, presents a four-prong test which is not easy to comply with. Accordingly, the dominant company has to prove that: a) the allegedly abusive conduct has realized or is likely to realize efficiencies; b) the conduct is indispensable to produce such efficiencies; c) the efficiencies benefit consumers; d) competition in a substantial part of the products concerned is not eliminated.” European Commission, DG Competition Discussion Paper on the Application of Article 82 of the Treaty to Exclusionary Some Abuses, 84-92 (2007), available at http://ec.europa.eu/comm/competition/antitrust/others/discpaper2005.pdf.).
548 Arezzo, supra note 540, at 466 (“although actual proof of consumer welfare diminution is not expressly required by the Sherman Act nor by other statutory provisions, an exclusionary conduct will not be punished lacking clear evidence of consumer harm.” Id. at 488).
549 Id. at 468.
E. Application of Antitrust law on IP in KR

Korean Antitrust Law and policy, the Monopoly Regulation and Fair Trade Act (MRFTA), is broader than the traditional United States and EU antitrust laws since MRFTA codifies regulations of unfair business practices as well as anticompetitive conducts. MRFTA codifies regulations about unfair business practices additionally, compared to the antitrust regulation in US. In Korean industry markets, it is not easy to find prospective competitors since the market has a rigid structure with high barriers to entry, and vertical relationship between dominant firms with market power and subordinate small companies dominates the market, rather than horizontal relationship, while in US real market is competitive with no barriers to entry.

Articles 3-2, 19, and 23 of MRFTA are dealing with prohibition on unfair business practices such as licensing arrangements beyond the scope of necessary IP rights exercise. Article 3-2 of the MRFTA prohibits “abuse of market dominant position;” Article 19 of the MRFTA forbids improper concerted acts like horizontal anticompetitive agreements; and Article 23 of the MRFTA is about “prohibition of unfair trade practices.”

Practically, in the continental law system countries including Korea, there are some restricted conditions to adopt and apply patent misuse doctrine to deny the patent rights in

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552 Choi, supra note 550, at 126.
infringement litigation, in that enactment of case law is restricted and generally authentication of administration acts is respected once the patent is granted legitimately.\textsuperscript{554}

However, Korea is more and more facing problems generated from strategies by multinational dominant firms controlling over world-wide markets with market power by enforcing exclusive and anticompetitive conducts such as strategic preemption and the blockade strategy over subsequent technological innovation based on their patent rights.\textsuperscript{555}

Up to the present, almost of patent disputes in Korea has been generated between competitors.\textsuperscript{556} As licensing trade is generalized, and diverse aspects of patent enforcement like patent pools and patent troll are generated, disputes between exercise of patent rights and anticompetitive conducts are anticipated.\textsuperscript{557}

Under MRFTA, KFTC notified officially “Review Guidelines on Unlawful Exercise of Intellectual Property” (IP Guidelines) for examination of “unfair acts of IP rights” and for “standards and categories of unfair trade conducts on international licenses” in 2010.\textsuperscript{558}

These IP Guidelines cover licensing arrangements and abuse of intellectual property rights such as “abuse of patent pool,” “patent ambush,” “patent lawsuit abuse,” and “unfair licensing,” and “unfair agreement in patent disputes,” pursuing enforcement of competition law against such conducts.\textsuperscript{559}

\textsuperscript{554} Oh, supra note 551, at 160.
\textsuperscript{555} Id. at 160 and 197.
\textsuperscript{557} Id.
\textsuperscript{558} Id. at 101.
\textsuperscript{559} Review Guidelines on Unfair Exercise of Intellectual Property Rights, Notice No. 12, Enacted on Aug. 30, 2000, Notice No. 80, Amended on Mar. 31, 2010 (Korea Fair Trade Commission): Unfair Agreement in Patent Disputes: A patentee and an interested party can settle a dispute regarding the effectiveness or infringement of patents not only by legal procedures such as
Although IP Guidelines were established with the purpose of harmonizing intellectual property rights and competition laws, thereby enhancing technology, innovation and consumers’ welfare, IP related regulations by KTFC, however, have been hardly ever enforced as of now since allegedly, the regulations including the official notification by KTFC does not reflect the real aspects and customs of IP related trade.\textsuperscript{561}

Therefore, first, clarification of relationship between MRFTA and patent misuse should be substantively defined.\textsuperscript{562} Second, regulations dealing with specifically unfair enforcement of IP rights should be articulated in MRFTA and concrete research should be preceded about how to apply the MRFTA and patent misuse to such behaviors.\textsuperscript{563}

II. APPLICATION OF US ANTITRUST LAW

A. APPLICATION OF SECTION I OF THE SHERMAN ACT TO UDC CASES

...
A settlement agreement in IP lawsuits shall raise antitrust issues. If the agreements between the patentee and the infringement defendant would cause restraint of trade, the agreements constitute a violation of Section 1. The agreements may involve “unrestricted or restricted licenses,” “cross-licensing,” patent pools, no licensing to third parties, licensing only jointly, “market division,” or “field-of-use agreements.” IP agreements are normally horizontal agreements since the “patent owner and accused infringer” are “actual” or “potential competitors in the market for the ultimate product and may be in the innovation market itself.”

The only factor that a licensing arrangement has a restraint which “affects parties in a horizontal relationship (a ‘horizontal restraint’),” however, does not always constitute antitrust liability. If the agreements take aspects of “joint ventures among horizontal competitors, licensing arrangements among such competitors may promote rather than hinder competition.” In particular, if the agreements provide “integrative efficiencies” generated from the “realization of economies of scale and the integration of complementary research and development, production, and marketing capabilities,” the conduct may not contravene the Section 1 of the Sherman Act.

The two factors to determine “whether the horizontal agreements between competitors are pro- or anticompetitive” are “whether the parties could have competed without the arrangement,” and “whether the underlying patents were valid and infringe.”

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564 HOVENKAMP, ET AL., supra note 13, at 7-3.
565 Id.
567 Id.
568 Id.
Analysis of UDC cases in view of violation of Section 1 of the Sherman Act will be discussed.

The invalidation lawsuits over UDC’s patents brought by Duksan Hi-Metal as discussed in Chapter 4 was interrupted by withdrawal of all pending invalidation litigations to resolve the dispute, where the challenging over five UDC’s PHOLED patents had been brought by Duksan Hi-Metal just after two of PHOLED patents were invalidated by a Japanese court.\(^570\)

Even a legal system in IP disputes “encourages parties to settle disputes,” and the outcome of the settlement might bring more anticompetitive effect than “the outcome of the underlying IP litigation” in the worst case.\(^571\)

Hypothetically, if the trials in IP disputes would decide the validity of the patents, the patent owner may enforce its monopoly power to the fullest extent. Instead, even though the settlement involves restricted licenses, so it may exclude other competitors, the settlement would less reduce competition than the monopoly generated from valid patents.\(^572\)

As the second scenario, if the interruption of the suits might be made for any kind of IP settlement between the two companies to build agreements of cooperation as win-win strategies, the agreement would fall into the horizontal\(^573\) IP settlement agreement since UDC and Duksan Hi-Metal has a horizontal relationship between a patent owner and an actual or

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\(^{570}\) The Osadirect Newsletter, supra note 430.

\(^{571}\) HOVENKAMP, ET AL., supra note 13, at 7-4.

\(^{572}\) Id.

\(^{573}\) If two parties are not actual or potential competitors in the market, the agreement conforms to pure vertical agreement.
potential competitor in the market for the ultimate product of OLED materials or in the innovation market.\footnote{574}{See HOVENKAMP, ET AL., supra note 13, at 7-3.}

Assuming that the agreement is to make joint ventures for integrative complementary research and development, production, and marketing capabilities,\footnote{575}{THE U.S. DEP’T JUST. AND THE FED. TRADE COMMISSION, supra note 482.} it would not anticompetitive violation of Section 1 of the Sherman Act.

By contrast, if the agreement, however, takes the form of “restricted or exclusive licenses” such as a “cartel agreement or a joint venture” to exclude other competitor in the market and eventually prevent free competitions, may constitute the violation of Section 1 of the Sherman Act.\footnote{576}{HOVENKAMP, ET AL., supra note 13, at 7-3.}

Virtually, by such agreement, the parties may enjoy a big incentive to maximize their own profits than increasing public welfare in the light of either competition or innovation.\footnote{577}{\textit{Id.}} Therefore, “judicial scrutiny” or “harsher scrutiny” shall be applied to this anticompetitive settlement “if an alternative and less harmful settlement was available.”\footnote{578}{\textit{Id.}}

As the third scenario, the patentee (UDC) and the challenger (Duksan Hi-Metal) in the patent invalidation lawsuits may reach agreements in order to conceal invalid patents.\footnote{579}{See Leslie, supra note 15, at 1276.} A patentee or a dominant firm sometimes uses the “anticompétitive and innovation-suppressing effects of patents” “to expand the scope of valid patents or to insulate invalid patents from judicial scrutiny” by conspiracies with a challenger or other competitive patent holder in innovation market.\footnote{580}{\textit{Id.}} Similar fact is found in \textit{Singer}, where “patent holders cross-licensed

\begin{footnotesize}
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\item[\footnote{574}{See HOVENKAMP, ET AL., supra note 13, at 7-3.}]
\item[\footnote{575}{THE U.S. DEP’T JUST. AND THE FED. TRADE COMMISSION, supra note 482.}]
\item[\footnote{576}{HOVENKAMP, ET AL., supra note 13, at 7-3.}]
\item[\footnote{577}{\textit{Id.}}]
\item[\footnote{578}{\textit{Id.}}]
\item[\footnote{579}{See Leslie, supra note 15, at 1276.}]
\item[\footnote{580}{\textit{Id.}}]
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their patents with mutual promises that they would not challenge the scope of each other’s patents in order to keep the ‘claims as broad as possible [which] indicates a desire to secure as broad coverage for the patent as possible, the more effectively to stifle competition.”

In the right of Antitrust Law, the conspiracies in the Singer case or the settlement agreements to conceal invalid patents in the lawsuits shall be contravention of Section 1 of the Sherman Act. Underlying substantial evidence is followed.

In the invalidation lawsuits challenged by the small businesses (Duksan Hi-Metal) against the dominant firm (UDC), if the Korean family patents were invalidated like the judicial decisions in the Japanese cases, then Korean OLED material manufacturers could potentially accelerate the entrance of the related market which results in competitive developing of cost-down materials. Moreover, Korean OLED panel makers could save high royalties for purchasing materials and have more selection choices of materials, which might provide development of advanced AMOLED (Active-matrix OLED) technology allowing for bright and energy efficient screens for cell phone and large scale televisions in cheaper prices for consumer’s welfare.

Hypothetically, if the withdrawal of the invalidation lawsuits were caused from pursuing a collaboration and concealment of UDC’s invalid patents, there must be reasons that small businesses may have high litigation cost barriers to challenge patents against a large firm; the possibility of winning the suits is very low; and the hostile challenging may adversely affect the research cooperation and business relationships between the small

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582 Leslie, supra note 15, at 1276 (quoting case cited supra note 581, at 190).
583 Case cited supra note 581.
584 Leslie, supra note 15, at 1276.
585 Kim, supra note 111.
businesses and the large firm or panel manufacturers. To wit, that collaboration might be an inevitable result as UDC's largest customers are Korean panel manufacturers with 59% of UDC revenue coming from Korea. Therefore, UDC would be much more concerned with developments in Korea through a long-term contract with Korean firms than in Japan.

From these agreements UDC may secure its monopoly power and the two parties in agreements would share the monopoly profits after the agreements, even though the invalidity of UDC’s patents have been reasonably doubtable, or the scope of the patents have been uncertain on the grounds that three Japanese family patents were found invalid, and judicial decisions of the EPO made it clear that UDC’s patents were too broadly claimed. Furthermore, the invalid broad claims shall keep preventing other competitors like material firms from developing high-quality materials, or follow-on innovation which result in destruction of competition and the panel manufacturers having to choose between lower quality alternative materials or expensive materials of UDC patented materials to make OLED panels.

Accordingly, agreements to conceal invalid patents by settlement in the invalidation lawsuits shall not be an optimal choice because they cause harm to both consumer and competitors. The third scenario is fully consistent with the violation of Section 1 of the Sherman Act.

587 Niu, supra note 472.
588 See HOVENKAMP, ET AL., supra note 13, at 7-3.
589 See Id. at 7-5.
590 See Leslie, supra note 15, at 1270-1271; See FED. TRADE COMM’N, supra note 11, at 5-6.
591 See Leslie, note 15, at 1276.
Even the settlement agreements shall not be immune from antitrust scrutiny under the *Noerr-Pennington* doctrine\(^{592}\) since the agreements are not aimed to seek aid from the government.

In view of patent misuse doctrine, as long as the issued patent is valid, the patentee can enforce the patent right to license to the extent of the legitimate scope. Under such circumstance, settlement agreements to conceal invalid patents in the lawsuits may not be patent misuse since the patent holder does not exercise its exclusive power beyond the legitimate scope of the patents.\(^{593}\)

**B. APPLICATION OF SECTION 2 OF THE SHERMAN ACT**

1. **Predatory Innovation**

   To violate Section 2 of the Sherman Act, a single dominant firm having monopoly power in the relevant market should “‘actually monopolize or dangerously threatens to do so’” as unilateral conducts.\(^{594}\)

   “Predation” is a conduct for purposely enhancing a dormant firm’s “competitive position” by “threatening to injure or actually injuring” actual or potential competitors in order to “keep them out of the market” or make competition limited, instead of development as a consequence of a superior product or true improvement of their “market performance.”\(^{595}\)

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\(^{592}\) Eastern Railroad Presidents Conference v. Noerr Motor Freight, Inc., 365 U.S. 127 (1961). The Supreme Court held that agreements to seek aid from the government are not violation of the Sherman Act. “The Sherman Act was not intended to regulate political activity, but only business activity.” The doctrine stipulate a “sham” exception, so only petitioning activities which are a genuine effort to influence legislation and law enforcement practices, are immunized from antitrust liability; LESLIE, *supra* note 484, at 112.

\(^{593}\) LESLIE, *supra* note 15, at 1276.

\(^{594}\) LESLIE, *supra* note 484, at 227 (quoting case cited *supra* note 508, at 459).

\(^{595}\) Ross D. Petty, *Antitrust and Innovation: Are Product modifications ever predatory?*, SUFFOLK U. L. REV. 999 (1988) (for example of predatory pricing, a firm reduces product’s price, “not because of lowered costs, but rather in order to induce the exit of rivals so that it may later recoup the costs of the price cutting through monopoly profits. In order to recoup its costs of predation, the firm must be able to keep all others from entering
Predation cases concerning the development of products by dominant firms have raised issues of diverse predatory innovation such as “design change,” “predisclosure” and “patent accumulation.” This strategy of the predatory innovation is frequently used to secure as much of the market created by a dominant firm as possible.

“Predatory innovation may violate Section 2 of the Sherman Act,” and besides, “FTC may regulate such behavior under Section 5 of the FTC.”

1-1. Standards for Assessment of Predatory Innovation

There are four other approaches to reason “whether innovation is anticompetitive” which can be applicable to assess predatory innovation.

The first approach is a “total economic welfare standard (total rule of reason test)” considering the “effect of a particular innovation on producer profits and consumer benefits.”

The second one is a “consumer welfare standard (consumer rule of reason test)” which has some weak points in dealing with “indirect benefits” or incomplete benefits.

The third one is the “profit sacrifice test” under which “predatory intentions are present if a practice would be unprofitable without the exit that it causes, but profitable with the exit.”

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596 Hurwitz & Kovacic, supra note 10.
597 Baskin, supra 3, at 1738.
599 Id.; Section 5 of the FTC is for a remedy and punishment of “unfair methods of competition in or affecting commerce and unfair or deceptive acts or practices in or affecting commerce,” 15 U.S.C. 45(a)(1).
600 Richard Gilbert, Holding Innovation to an Antitrust Standard, 3 COMPETITION POL’Y INT’L, 53 (Spring 2007); LESLIE, supra note 484, at 229-230.
601 Gilbert, supra note 600; LESLIE, supra note 484, at 229-230.
602 Gilbert, supra note 600, at 55; LESLIE, supra note 484, at 229-230.
The fourth one is “no economic sense test” under which “conduct is not exclusionary or predatory unless it would make no economic sense for the defendant but for the tendency to eliminate or lessen competition.”

1-2. Design Change

Design change can be claimed by injured competitors if a dominant firm (or monopolist) changed its patented product in the first market to keep competitors from entering into the market. The “predatory design change” claims can be triggered between two competitive firms which make “complementary products” in the “primary and secondary markets” where a dominant firm having market power by preoccupying the primary market.

The dominant firm reformulates the product in the primary market and tries to increase its profits further in the secondary market with the modified product by frustrating other competitor. In reality, the representative cases relating dominant firms such as “Eastman Kodak,” “IBM,” and “AT&T” have issued this predatory design change.

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603 Gilbert, supra note 600, at 57 (“An improvement in the quality of a product is similar to a reduction in its price. Rivals may be unable to compete with the new and improved product and may exit the industry or fail to make investments necessary to remain as effective competitors.” Id. quoting Janusz Ordover & Robert Willig, An Economic Definition of Predation: Pricing and Product Innovation, 91(1) YALE L.J. 8-53, 9 (1981); LESLIE, supra note 484, at 229-230.

604 Gilbert, supra note 600, at 60 (quoting Gregory Werden, Identifying exclusionary conduct under Section 2: The “No Economic Sense” Test, 73(2) ANTITRUST L.J. 413 (2006)); LESLIE, supra note 484, at 229-230.

605 Baskin, supra note 3, at 1736.

606 LESLIE, supra note 484, at 242.

607 Id.


609 California Computer Prods., Inc. (CalComp) v. IBM Corp., 613 F.2d 727 (9th Cir.1979); Telex Corp. v. IBM Corp., 510 F.2d 894 (10th Cir.), cert. denied, 423 U.S. 802 (1975); Transamerica Computer Co. v. IBM Corp., 481 F. Supp. 965 (N.D. Cal. 1979), appeal docketed, No. 80-4048 (9th Cir. Jan. 31, 1980).


611 Hurwitz & Kovacic, supra note 10.
I-3. Predisclosure

Another type of the predatory innovation is “predisclosure” which was analyzed in *Berkey Photo, Inc. v. Eastman Kodak Co.*, \(^{612}\) where two issues were raised concerning the predisclosure. The one is whether the dominant firm must inform competitors design change before the launching of the new product, and the other one is whether the released information about the quality of new product is “unjustifiably exaggerated” enough to prevent competitors profits. \(^{613}\) The *Berkey* court held that Kodak did not have predisclosure duty to related competitors, only given that it released a new product as a unilateral conduct. \(^{614}\) By contrast, if the dominant firm attempts to force joint ventures not to disclose it voluntarily, the conduct shall constitute anticompetitive violation. \(^{615}\)

I-4. Patent Accumulation

Patent accumulation is well-known “blocking” strategy as one of patent evergreening tactics. If there is any anticompetitive intent in building patents which are fabricated to secure their monopoly power or to make defensive patents against competitors, this conduct will “deter market entry and follow-on innovation by competitors,” and “unjustifiably raise costs to business and, ultimately, to consumers.” \(^{616}\)

In *Van Dyk Research Corp. v. Xerox Corp.*, \(^{617}\) the court found that the conduct of accumulating patents by dominant firms was the result of progressing research and development as a legal exercising within patent system. The court, however, did not clarify

\(^{612}\) *Berkey*, 603 F.2d at 263 (citation omitted).

\(^{613}\) Hurwitz & Kovacic, *supra* note 10, at 113-114.

\(^{614}\) LESLIE, *supra* note 484, at 223.

\(^{615}\) Hurwitz & Kovacic, *supra* note 10, at 124.

\(^{616}\) See FED. TRADE COMM’N, *supra* note 11, at 5-7.

the effect on the antitrust liability inquiry about whether the development or research itself was made by anticompetitive purpose or intent.\footnote{Hurwitz & Kovacic, supra note 10, at 125.}

Similar decision is found in *SCM Corp. v. Xerox Corp.*, the trial court held that patenting premised on internal research and development is the company’s freedom under the patent law.\footnote{Id. at 127.}

The two cases, however, did not provide a concrete standard to assess “whether an internal research and development program” framed for blocking new entry intentionally would not be liable to any challenges under antitrust law.\footnote{Id.}

The precedents seem to advocate dominant firms’ conduct of patent accumulation under the boundary of patent system if they do not have anticompetitive intent during the patent programing. The courts’ rational is premised on the analysis that the condemnation of patenting accumulation under antitrust law liability will trigger suppressing of exercising free-will innovation of dominant firms, even though the patents would be turned out later to be blocking patents\footnote{John H. Barton, supra note 9.} made with specific intent to block competitors’ entrance and to extend their market power. Moreover, the courts failed to suggest a clear underlying basis for inquiry whether the anticompetitive intent in the internal R&D process would be the main factor to find antitrust liability.\footnote{Hurwitz & Kovacic, supra note 10, at 127.}

The trial court’s opinion in *SCM Corp. v. Xerox Corp.*, however, provides a discussion that an exception existed if a company had “acquired monopoly power in a relevant market.”\footnote{Id. at 126.} Thus, if the “internal developed innovation” was made primarily
with predatory or exclusionary intent of “‘blocking the development and marketing of competitive products rather than primarily to protect its own products from being imitated or blocked by others,’” the company cannot acquire “new patents on internal developed innovation.”

Following analysis in 1-5 Section will explain why the purpose of internal R&D be an essential aspect to determine the antitrust liability, and also why the patentability of the cumulated patents would adversely affect free completion in the relevant market. To wit, in order to assess the liability of patent accumulation conduct based on balance standard to meet objectives of the patent law and antitrust law at the same time, jurisdiction should consider two prongs of dominant firms’ blocking intent and the patents’ validity because virtually, two factors would give synergistically adverse effect on competition and consumer’s welfare.

Only genuine efforts in order to make improved innovation and build patent portfolios without any anticompetitive intent could be acknowledged as a true internal free will patenting complying with goals of patent law and antitrust law, which eventually brings promotion of innovation and consumer’s welfare.

1-5. Application of Predatory Innovation Theory to Invalid Patents and Blocking Patents

While valid patents work well with competition to promote innovation, questionable patents that are likely invalid or claim broadly may block competition in diverse ways. Patents owned by a dominant firm can block other patentee’s exploitation of its own

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624 Id.
625 See Leslie, supra note 15, at 1270-1271.
626 See FED. TRADE COMM’N, supra note 11, at 18.
627 Id. at 5.
invention, so the blocking patents may inhibit competitors’ entry into the market since competitors try to avoid infringing such patents, which results in the suppression of competition. In addition, “if the blocking patent is invalid or overbroad, no public benefits exist to justify its effects on follow-on innovation.”

Over the questionable patents, competitors may take three actions. First, when a competitor goes forward to launch R&D in the related field “improperly covered by the questionable patents” without a permission to use the patent by licensing to the patent, the competitor should take a risk of the “expensive and time-consuming litigation” brought by the patent owner.

Second, assuming that a competitor negotiates license to the questionable patents in advance, the license will bring so much burden of unreasonable royalties for the “follow-on innovation and commercial development.”

Third, a competitor might challenge the questionable patents to invalidate them before the PTO, but the “procedures allow only very limited participation by third parties, however.” Moreover, a competitor may not bring a lawsuit before the Federal Court for a challenging the invalid patent unless the patent holder warns the competitor of infringement litigation. The litigation definitely costs the competitor years and millions of dollars. This wasting of resources affects negatively on customers’ welfare.
The other issue in OLED industry is overlapping of patent rights which have also act like blocking patents or defensive patents which have interference relationship each other, so neither firm can exercise their invention without infringement of their patents.\textsuperscript{635} These kinds of defensive patents can trigger “licensing difficulties, such as royalties stacked one on top of another,” and can complicate their patent management.\textsuperscript{636} This also affects directly current researchers or makers by frustrating a competition since they need the licenses of all defensive patents or blocking patents to enter the market that cover their product.\textsuperscript{637}

By contrast, the patent holder who is making the blocking patents in order to inhibit upcoming competition can make benefits from high royalties or threatening litigation, even though the patents may be invalidated\textsuperscript{638} Virtually, this patterning makes competitors subjected to the blocking patents and prevents follow-on innovation, raising costs unjustifiably to business and to consumers.\textsuperscript{639}

1-6. Application of Predatory Innovation Theory to UDC Cases

Analysis of UDC cases in view of violation of Section 2 of the Sherman Act will be discussed.

As analyzed in Chapter 2, UDC, a leading company in PHOLED technologies, holds original patents covering PHOLED materials supplied to worldwide panel manufacturers.\textsuperscript{640}

\textsuperscript{635} LESLIE, supra note 484, at 7.
\textsuperscript{636} FED. TRADE COMM’N, supra note 11, at 7.
\textsuperscript{637} Id.
\textsuperscript{638} FED. TRADE COMM’N, supra note 11, at 7 (citing United States Patent and Trademark Office Free Modernization Act of 2003: Hearing Before the Subcomm. On Courts, the Internet, and Intellectual Property of the House Comm. on the Judiciary, 108\textsuperscript{th} Cong. 2 (2003) (“Large and small companies are increasingly being subjected to litigation (or its threat) on the basis of questionable patents”)).
\textsuperscript{639} Id.
\textsuperscript{640} Finanznachrichten.de, supra note 75; See Nanomarkets, supra note 77 (“it is widely accepted that only the use of PHOLEDs will enable OLEDs to reach the efficiencies required for truly deep penetration by OLED technology”).
Additionally, due to the growth of PHOLED material markets, UDC’s market share is increasing in OLED lighting industry as well as OLED display industry.

Accordingly, UDC, as a single dominant firm has monopoly power in the relevant PHOLED market.

As analyzed in Chapter 5, patentability of UDC’s patents related to invalidation cases are reasonably doubtable, or the scope of the patents is uncertain on the grounds that three Japanese family patents were found invalid and judicial decisions of the EPO made it clear that UDC’s patents were too broadly claimed.

The broad claims may block other patentee’s exploitation of its own invention, so the blocking patents may inhibit competitors’ entry into the market since competitors try to avoid infringing such patents, which results in the suppression of competition.

Hypothetically, if UDC has any anticompetitive intent in the course of development or research to secure their monopoly power by the accumulation of blocking patents, rather than it has improved the PHOLED technologies, this conduct will raise costs unjustifiably to business and to consumers.

Virtually, UDC which has been granted the patent rights and enjoyed exclusive dominant market power with invalid patent rights, tried to “preserve and extend its market share by excluding or preventing” other competitors like material firms from developing

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641 See Dispalybank, OLED Lighting Industry Report - 2012, 1 (2012) (“OLED lighting is a surface style, and can be manufactured in a transparent or flexible appearance, and has characteristics that realize excellent color rendering and a variety of colors. OLED lighting is drawing attention as a next-generation lighting to bring a new paradigm to the lighting industry”).
642 See Nanomarkets, supra note 77 (“efficiency will be a key factor in contributing to OLED lighting’s cost proposition….expect OLED lighting to use very large amounts of material after 2015 or so”).
643 FED. TRADE COMM’N, supra note 11, at 5-6.
644 FED. TRADE COMM’N, supra note 11, at 7.
high-quality materials using its previously obtained monopoly power.\footnote{Leslie, supra note 484, at 219.} Even if the monopoly “power has been legitimately acquired, the monopolist may not wield it to prevent or impede competition.”\footnote{Id.}

To fulfill Section 2 violation, the effect of a monopolist’s conduct on the “competitive process” and consumers should be harmful, rather than the effect on competitors.\footnote{Id. at 250 (quoting case cited supra note 486).} “Lawful competition” can provide benefits of “superior products” such as new and improved products.\footnote{Leslie, supra note 484, at 250 (citing Berkey, 603 F.2d at 263)).} Thus, a monopolist can raise its market share and creates a demand for another invention by the enhanced technological innovation, which complies with the primary purpose of Sherman Act.\footnote{Leslie, supra note 484, at 250 (citing Foremost Pro Color, Inc. v. Eastman Kodak Co., 703 F.2d 534, 546 (9th Cir. 1983)).} Even though “improved products may harm” profits of competitors in the relevant market, the detriment is an inevitable result of free competition.\footnote{Leslie, supra note 484, at 250 (citing Hotvemp, et al., supra note 13, at 12-2).} Actually, it is a tricky issue in a court trial to differentiate the harm caused by “anticompetitive conducts” from the detriment caused by “innovative competition.”\footnote{Id. at 250-251 (quoting IIIA PHILLIP E. AREEDA & HERBERT HOVENKAMP, ANTITRUST LAW 776d (2d ed. 2002)).}

For the foregoing reasons, two standards to distinguish the harms are suggested. One standard is that an “antitrust claim premised on the introduction of new products must be supported by evidence” that before the launching the new product in the market, the inventor should know that the product was not improved one, but instead, it was made intentionally to exclude a competitor’s complementary invention.\footnote{Id. at 250 (citing IIIA PHILLIP E. AREEDA & HERBERT HOVENKAMP, ANTITRUST LAW 776d (2d ed. 2002)).} In Microsoft, however, Plaintiffs do not have a duty to prove the evidence, but instead, “if Plaintiffs show anticompetitive harm” from

\footnote{Id. at 250 (citing IIIA PHILLIP E. AREEDA & HERBERT HOVENKAMP, ANTITRUST LAW 776d (2d ed. 2002)).}
predatory innovation, “that harm will be weighed against any benefits presented by Defendant.”653

The other standard is that if consumers can have free choices to select products coming from the new innovation by a monopolist, and enjoy the results of the competition “rather than its absence,” antitrust law should not contravene the conducts.654 On the contrary to this, if the new invention by a monopolist prevents consumers’ free choice, the scrutiny should apply to the conduct.655 If Defendants “suppressed competition by blocking” new entry of improved products, such conduct leads to “consumer coercion” and thus it is “potentially anticompetitive.”656

Since UDC’s blocking invention prevented developments of high quality materials by other competitors, the panel manufactures could not make cheaper and high technology devices, and such result decreased consumers’ choice and welfares to enjoy the invention. The theory underlying for the arguments is that even though UDC claimed PHOLED materials very broadly, the firm could not test light emitting efficiencies of all claimed materials to find appropriate materials for the devices, and moreover, could not produce or sell all materials. To wit, the broad claims were fabricated intentionally for blocking development of improved materials by other competitors.

This conduct resulted in destruction of competition, and the panel manufacturers have to choose between lower quality alternative materials or expensive materials of UDC to make OLED panels. In view of that evidence, this patent accumulation as predatory innovation

653 LESLIE, supra note 484, at 252 (citing United States v. Microsoft Corp., 253 F.3d at 59, 66-67 (D.C. Cir. 2001)).
654 LESLIE, supra note 484, at 251.
655 Id.
656 Id. at 253 (citing Berkey, 603 F.2d at 287).
reasonably constitutes “restrictive or exclusionary conduct” in the market in which the firm already has monopoly power. 657 If the dominant firm could actually monopolize the relevant market as the predatory innovation, it would be the offense of monopolization. In addition, if the dominant firm has generated predatory innovation with a specific intent to monopolize the PHOLED market, and the conduct has caused a dangerous probability of achieving monopoly power, 658 it shall fall into attempted monopolization.

1-7. Application of Predatory Innovation Theory to Idemitsu Kosan’s Cases

Analysis of Idemitsu Kosan cases in view of violation of Section 2 of the Sherman Act will be discussed.

As analyzed in Chapter 2, Idemitsu Kosan has taken the world’s largest market share as a leading company in OLED technologies, and has built powerful original patent portfolios, developing organic layer materials and fluorescence materials for blue host, green host, and green dopant. 659 Accordingly, Idemitsu Kosan, as a single dominant firm, has monopoly power in the relevant OLED market. 660

As investigated in Chapter 5, according to the final judgment from the Japanese IP High court (JP 3981331) in Hodogaya v. Idemitsu Kosan, 661 Idemitsu Kosan’s combination patents are not true innovation, but only useful as blocking patents for producing device panels partially containing the combination materials.

657 LESLIE, supra note 484, at 239.
658 Id. at 32 (“The Market share requirement for attempted monopolization is lower…around 35 percent or higher depending on the presence of barriers to entry”).
659 Business Wire, supra note 80; Olednet.co.kr, supra note 97.
660 Kim, supra note 111.
661 As of 18 Nov. 2010, the Japanese IP High court finally confirmed the JPO's conclusion of the invalidation trial that the present invention has the invalidation reason without further request of appeal. Case cited supra note 288.

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As another ground for the arguments, the combination of only two materials cannot ensures the generation of brilliant luminescent effects since the OLED device releases the emitting result by perfect harmonization of all organic layers which contain more than ten materials. Thus these blocking patents may not be the result of true innovation which contributes to OLED industry via the suggestion of new combination of materials, but rather they hold back the development of technology by panel manufacturers which fabricate the device with the original materials using their innovative skills.

Discussed Idemitsu Kosan’s questionable combination patents which were invalidated and are in pending invalidation cases were timely filed when prototype panels containing the claimed materials for a device from Samsung Display Co. Ltd. (SDC) were on display or at the R&D step of fabricating OLED the before the final product launched in the market.

Since 2006, the tension between panel manufactures and Idemitsu Kosan increased. Idemitsu Kosan gave panel manufactures a patent infringement warning before an infringement lawsuit action, and it demanded panel manufactures to pay royalties in return for using the patents. In addition, the firm knew that the combination patents would prevent panel manufactures from using these specific materials without entering into a licensing agreement with Idemitsu Kosan.

Even though the OLED materials that compose the organic layer of the OLED panels do not contain exactly the same materials claimed in the patents owned by Idemitsu Kosan, if OLED material suppliers to the panel manufactures are involved in infringement litigation with Idemitsu Kosan over the relevant OLED material, they cannot keep doing business with panel manufactures as a supplier.
Moreover, Idemitsu Kosan was aware that the specific material manufactures like Duksan Hi-Metal, SFC, AINNOS\textsuperscript{662} or Hodogaya could not sell their product to panel manufactures during the infringement lawsuits.

Since 2010, however, it has been doubtable that Idemitsu Kosan could follow the trend of materials imbedded in mobile display panel using the strategy of combination patents because the panel manufacture controls 99.5 percent of the global OLED panel market share\textsuperscript{663} as a number one panel provider, but Idemitsu Kosan has been still making OLED materials through modification of original materials without exact knowledge about the structure of recent device panels and the fabrication thereof.

As explored in Chapter 5, since the broad Supreme Court’s test in \textit{KSR}\textsuperscript{664} made it difficult to prove non-obviousness, obtain patents and preserve the validity of patents based on the combination of known elements, only truly innovative invention shall be held valid.\textsuperscript{665} If the Supreme Court’s decision acts as \textit{stare decisis} over the independent judgment of the federal circuit, the defense of invalidating contested patents shall have a strong legal basis in infringement litigation.\textsuperscript{666}

Considering the result of the Supreme Court ruling in \textit{KSR}, it will be more difficult for Idemitsu Kosan to defend currently issued patents or to obtain additional patents based on the strategy of combination invention in the future.\textsuperscript{667}

\textsuperscript{662} AINNOS Co., a Korean chemical company, is engaged in the manufacturing of OLED materials and sale of them.
\textsuperscript{663} Guangzhou Etoplink Co. LTD, \textit{supra} note 82.
\textsuperscript{664} \textit{KSR}, 550 U.S. at 400.
\textsuperscript{665} \textit{Faga}, \textit{supra} note 107, at 495.
\textsuperscript{666} \textit{Id.}; Irfan A. Lateef & Joshua Stowell, \textit{Special Feature: A Supreme End to Patent Troll?}, 49 \textit{ORANGE COUNTY LAW.} 18, 22 (2007).
\textsuperscript{667} See \textit{Faga}, \textit{supra} note 107, at 495.
As an inevitable adverse effect of these invalid patents, including combination patents, competitors are blocked to preempt the global market. Those blocking patents at issue have been preventing other competitors from developing high-quality materials and this inhibition has increased the market price of materials in the market.\(^{668}\)

In addition, those patents are blocking the panel manufacturers from combining the materials which are claimed in the invalid combination patent, which resulted in the panel manufacturers having to choose between lower quality alternative materials or expensive materials of the patented materials to make OLED panels. It caused harm to both consumers and competitors.

This conduct, exercising the monopolist’s power to secure and extend its monopoly right, adversely affects consumer’s welfare to enjoy high quality and cheap products by preventing free competition with material competitors and panel manufactures in their relevant market.

Under such circumstance, this patent accumulation by Idemitsu Kosan as predatory innovation reasonably constitutes “restrictive or exclusionary conduct” in the market in which the firm already has monopoly power.\(^{669}\) If the dominant firm could actually monopolize the relevant market as the predatory innovation, it would subject to monopolization under Section 2 of the Sherman Act.\(^{670}\)

Even if the dominant firm could not actually take monopoly power due to the conduct, assuming that the firm generated predatory innovation with a specific intent to monopolize

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\(^{668}\) See FED. TRADE COMM’N, supra note 11, at 5-6.

\(^{669}\) LESLIE, supra note 484, at 239.

\(^{670}\) See Id. at 227 (Oxford, 2011) (To violate Section 2 of the Sherman Act, a single dominant firm having monopoly power in the relevant market should “actually monopolize or dangerously threatens to do so” as unilateral conducts (quoting case cited supra note 508, at 459)).
the OLED market, and the conduct has caused a dangerous probability of achieving monopoly power, it would constitute attempted monopolization.671

2. Sham Patent Infringement Litigation

If a patentee brings patent infringement litigation or threatens the litigation premised on invalid patents “in bad faith with intent to restrain competition or monopolize” or attempt to monopolize “by enforcing known invalid patents,” this conduct is subject to a Section 2 violation since it injures “both competition and innovation.”672 If that conduct is made by a group of patentees, this constitutes a Section 1 violation.673 To constitute “sham” litigation, first, the infringement lawsuits should be “objectively baseless in the sense that no reasonable litigant could realistically expect success on the merits.”674 Second, the lawsuits should hide “an attempt to interfere directly” rivals’ business and new entrance in the market.675 Even when the patentee is aware that the competitor does not infringe their patent, the patentee may take infringement litigation against the rival. Moreover, even though the allegedly infringed patent is valid, the fact or the allegation does not affect that the lawsuit is not sham litigation.676

As to the UDC lawsuits, since UDC has not brought infringement lawsuit, UDC may not be charged with a sham. But, hypothetically, if there were threats or warning of

671 See LESLIE, supra note 484, at 31-32 (Oxford, 2011) (“The Market share requirement for attempted monopolization is lower...around 35 percent or higher depending on the presence of barriers to entry”).  
672 Id. at 106-107; Leslie, supra note 15, at 1274.  
673 LESLIE, supra note 484, at 106-107.  
675 Leslie, supra note 15, at 1275 (quoting case cited supra note 674, at 60-61).  
676 Leslie, supra note 15, at 1275.
infringement litigation by UDC based on invalid patents, it would be subject to sham litigation.\(^{677}\)

Likewise, in the invalidation lawsuits over Idemitsu Kosan’s combination patents, there were not visible infringement litigation actions brought by Idemitsu Kosan, but assuming that the dominant firm has warned competitors of infringement litigation premised on the invalid patents, it would constitute sham litigation.\(^{678}\)

### 3. Enforcement of a Fraudulently Procured Patent

In the patent infringement litigation, fraudulently procurement of the patent can be used as a defense by defendant. In *Walker Process*,\(^{679}\) “enforcement of a patent obtained through knowing and willful fraud may violate Section 2 of the Sherman Act.”\(^{680}\) To fulfill Walker Process claim, three conditions should be satisfied, which are: “(1) the patentee knowingly and willfully omitted or misrepresented material facts to the PTO in procuring the patent; (2) the patent would not have issued but for the fraud; and (3) the patent holder has monopoly power or the dangerous probability of achieving monopoly power.”\(^{681}\)

Considering the analysis in the previous section, predatory innovation of Idemitsu Kosan and UDC may not constitute fraud because the dominant firms have not brought


\(^{678}\) See *LESLIE*, *supra* note 484, at 106-107; Leslie, *supra* note 15, at 1274.


\(^{681}\) Id. (“A related Section 2 theory focuses on a patent holder's initiation of litigation to enforce a patent it knows to be invalid. The plaintiff must prove the defendant's bad faith in initiating litigation by clear and convincing evidence...Thus, the fraud on the PTO itself does not give rise to an antitrust violation, nor does attempted enforcement of an invalid patent. The thrust of the violation is monopolization or attempted monopolization of a relevant market, accomplished by those means”).
patent infringement lawsuits, and there was not any evidence of knowing and willful fraud in the procurement of the patents before the Patent Office.\textsuperscript{682}

4. Enforcement of Invalid Patent Right

Enforcement or attempted enforcement of invalid patent rights obtained by fraudulent procurement before the Patent and Trademark Office may constitute the violation of section 2 of the Sherman Act, or section 5 of the Federal Trade Commission Act.\textsuperscript{683} “Actual or attempted enforcement of patent rights obtained by inequitable conduct that falls short of fraud may violate section 5 of the Federal Trade Commission Act,” but may not be the grounds of section 2 of the Sherman Act unless the conduct relates to “knowing and willful fraud and the other elements of a section 2 claim” are satisfied.\textsuperscript{684} Enforcement of invalid patent rights by “objectively baseless litigation” may fall into the violation of section 2 of the Sherman Act, eliciting sham litigation.\textsuperscript{685}

\textsuperscript{682} See Leslie, \textit{Antitrust Law and Intellectual Property Rights}, OXFORD UNIVERSITY PRESS, 92 (2011); See Chu, \textit{supra} note 527, at 1357 (“if a patent is not strong enough to dominate a market, certain uses of the patent still may clash with antitrust principles. These uses include procurement fraud and patent misuse…Procurement fraud refers to any dishonesty, impropriety, or otherwise inequitable conduct during the patent application process for obtaining a patent…A patent issued under these circumstances is invalid, and any subsequent monopoly power held by the patentee may violate the antitrust laws. Action may be taken under Section 2 of the Sherman Act or under the FTC Act”).

\textsuperscript{683} LESLIE, \textit{supra} note 484, at 646.

\textsuperscript{684} \textit{Id}.

\textsuperscript{685} \textit{Id}; See Yoshitani & Cooper, \textit{supra} note 680 (“In \textit{Professional Real Estate Investors, Inc. v. Columbia Pictures, Inc.}, the Court held that litigation is sham conduct if the suit is objectively baseless (i.e., no reasonable litigant could realistically expect to succeed on the merits)” (citing case cited \textit{supra} note 674).
III. APPLICATION OF PATENT MISUSE

Patent misuse doctrine is framed to prevent a patentee from enforcing patent rights to extend them and to obtain market benefit beyond the legitimate scope of its grant.\(^\text{686}\) The reason why “patent misuse is theoretically broader than antitrust law” is that an antitrust plaintiff should take a burden of proof to show the evidence of “antitrust injury,” and should prove “all elements of the substantive antitrust claim, such as monopoly power.”\(^\text{687}\) Patent misuse, however, has a limitation that it’s only effective for a defense without any affirmative claim for damages from anticompetitive conduct beyond scope of the patent rights, while antitrust law provides compensation to injurer as a cause of action.\(^\text{688}\) The difference arises from that patent misuse is framed to punish patent infringers rather than patentees.\(^\text{689}\)

According to the section 271(d)(3) of the Patent Act,\(^\text{690}\) if a patentee having monopoly power seeks to “enforce patent rights against infringement or contributory infringement” with “intent to unfairly control…the relevant market,” the conduct falls into patent misuse.\(^\text{691}\)

As discussed previously, hypothetically, if the patentee (UDC) and the challenger in the patent invalidation lawsuits reach settlement agreements in order to conceal invalid patents, such agreements would not be condemned in the view of patent misuse doctrine, since the patents in the lawsuits is presumed valid as long as PTO issued the patents, so the

\(^\text{686}\) James A. D. White, Misuse or Fair Use: That Is The Software Copyright Question, 12 BERKELEY TECH. L. J. 251, 252 (1997) (“patent misuse doctrine has for decades prevented patent holders from unduly extending the rights granted to them beyond the scope of the patent”).

\(^\text{687}\) LESLIE, supra note 484, at 61.

\(^\text{688}\) Leslie, supra note 15, at 1284.

\(^\text{689}\) Leslie, supra note 15, at 1285.


\(^\text{691}\) Chu, supra note 527, at 1367.
licensing agreements is allowable enforcement within the scope of patent rights, even though that conduct possibly is charged with Section 1 liability.\textsuperscript{692}

As to the UDC patents invalidation lawsuits, since UDC has not brought visible infringement lawsuit grounded on invalid patents against the competitors who have brought invalidation lawsuits, UDC might not constitute patent misuse. But, hypothetically, if there were any enforcement of patent rights like threats or warning of infringement litigation by UDC based on the predatory innovation with intent to unfairly control the relevant market, it might be subject to patent misuse. However, based on the theory that the conducts that limits subsequent innovation related patents as well as triggers anticompetitive effects on the market falls into the category of patent misuse,\textsuperscript{693} the predatory innovation of UDC itself which adversely blocking improving innovation of competitors resulted in anticompetitive effects, without further enforcing acts constitutes patent misuse.

Likewise, in the invalidation lawsuits over Idemitsu Kosan’s combination patents, there was not any infringement litigation action brought by Idemitsu Kosan, but assuming that the dominant firm has warned competitors of infringement litigation premised on the predatory innovation, or considering the patent misuse theory, it might fall into patent misuse.

\textbf{IV. SUMMARY AND DISCUSSION}

Patent Law lies in the fine balance between “promoting innovation” and protecting the exclusive and monopoly “right to profit from invention.”\textsuperscript{694} In \textit{KSR}, the Supreme Court established the balance between the competing goals of the innovation and the monopoly

\textsuperscript{692} See Leslie, \textit{supra} note 15, at 1276.
\textsuperscript{693} White, \textit{supra} note 523.
\textsuperscript{694} Faga, \textit{supra} note 107, at 498.
through granting patents to genuine innovations, while rejecting patents to invalid innovations which do not fulfill the requirement of non-obviousness test.\textsuperscript{695} That is to say, although these two policies look paradoxical, “the requirement for patent validity” made a boundary for “truly innovative patents.”\textsuperscript{696}

Ultimate goal of Antitrust Law (codified in the Sherman Act and the FTC Act) and Patent Law is “to maximize consumer welfare by encouraging firms to behave competitively.”\textsuperscript{697} Therefore, antitrust law and patent law are not “inherently conflict” and instead, “actually complementary” each other.\textsuperscript{698} Monopoly power authorized to a patentee by the grant of patent rights, itself does not constitute an antitrust violation.\textsuperscript{699} Antitrust law, however, connotes that the monopoly power created from the patent rights is essential to achieve the consumers’ welfare.\textsuperscript{700} Through the limiting the duration of the patent rights, the patent law implicates a balance between encouraging innovation and preventing anticompetitive monopoly.\textsuperscript{701}

As discussed previously, supposedly, if the patentee (UDC) and the challenger in the patent invalidation lawsuits may reach agreements in order to conceal invalid patents,\textsuperscript{702} that settlement agreement is fully consistent with Section 1 liability of the Sherman Act. On the

\textsuperscript{695} Id.; See KSR, 127 S. Ct. at 1727 and 1743.
\textsuperscript{696} Faga, supra note 107, at 498.
\textsuperscript{697} FED. TRADE COMM’N, supra note 11, at 1.
\textsuperscript{698} Id. at 2.
\textsuperscript{699} Id.
\textsuperscript{700} Id. at 3.
\textsuperscript{701} Id. (citing Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 146 (1989) (federal patent laws embody “a careful balance between the need to promote innovation and the recognition that imitation and refinement through imitation are both necessary to invention itself and the very lifeblood of a competitive economy”)).
\textsuperscript{702} See Leslie, supra note 15, at 1276.
contrary, patent misuse doctrine cannot punish such licensing agreement since the conduct is legitimately allowable in the patent system.\textsuperscript{703}

In the light of Korea IP Guidelines under MRFTA by KFC, unfair agreement by settling the disputes between competitors in patent disputes such as patent invalidity litigation in order to shield invalid patents, which, as a result, helps keeping their monopoly power and blocking the market entry against competitors in the relevant market, thus undermining the welfare of consumers, shall be “determined to be out of fair exercise of patent rights.”\textsuperscript{704} Particularly, “if parties to the agreement knew that the patent which is the subject matter of the dispute is invalid or if it is objectively obvious” that the patent is invalid,\textsuperscript{705} such conduct shall be a violation of Article 19 (Prohibition on Unfair Collaborative Practices) of the MRFTA.

Furthermore, as previously analyzed in Section B, if the predatory innovation such as the broad claimed UDC’s patents and the combination patents of Idemitsu Kosan restricts the competition or actually monopolizes the relevant market, such conduct shall be subject to Section 2 of the Sherman Act as monopolization or attempted monopolization.

In addition, hypothetically, if the predatory innovation is exercised with any enforcement of patent rights like threats or warning of infringement litigation by the dominant firms with intent to control unfairly the relevant market, that conduct would constitute patent misuse.

\begin{footnotesize}
\textsuperscript{703} See Id.
\textsuperscript{704} Review Guidelines on Unfair Exercise of Intellectual Property Rights, \textit{supra} note 559, at 24-25.
\textsuperscript{705} Id.
\end{footnotesize}
According to the underlying theory that an antitrust law violation relating a patent falls into patent misuse, the predatory innovation might be categorized to patent misuse. Moreover, if the legitimate scope of rights within patent misuse contains exclusive rights as defensive rights as well as patent litigation action, then the intentional innovation by the blocking patents inhibiting competition might cause unlawful exclusive rights out of scope of patent system. Whether the predatory innovation constitutes patent misuse or not should be discussed further in the future research.

In view of the European competition laws, the predatory innovation which is implemented through accumulation of blocking patents to secure monopoly power with anticompetitive intent may not be condemned because the conduct was aimed to accomplish a “dominant position” strategically, and moreover, “intent” factor is not considered as unilateral abuses under Article 82. So, European abuse doctrine does not consider attempt monopolization based on the predatory innovation.

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706 White, supra note 523.
707 Arezzo, supra note 540, at 465.
CHAPTER SEVEN  PROPOSAL FOR REFORMATION OF PATENT SYSTEM AND STANDARDS OF PATENTABILITY

I. BACKGROUND AND ISSUES

A. PROBLEMS OF PATENT SYSTEM

We also consider the role of Korean IP Office (KIPO) to balance between the patent applicant’s interest and public’s welfare. Sometimes, KIPO seems to treat patent applicants like main customers, so KIPO makes tempting policies to attract patent applicants even targeting other countries’ applicants as sort of marketing IP business.

Recently, even “conforming to applicants” programs or services become the main standard in the course of patent examination in KIPO. All procedures seem to favor only applicants and all related policies focus on how to satisfy patent applicants. Some critics insist in the media that the government organization should serve for publics, not just for the minor group like patent applicants or patent lawyers. As stated in patent law, the role of KIPO lies in issuances of valid patents, thus encouraging “invention, disclosure and commercial development” of industries.708 Furthermore, KIPO should protect public against the granted invalid patents because they bring excessive cost to competitors and customers in the market, and confer an undue market power to patent holders, which eventually, disturb free competition in the market.709

Another problem is that KIPO has not paid attention to antitrust law or competition law as much as the patent system. Almost policies have been oriented to interest of patent

708 See FED. TRADE COMM’N, supra note 11, at 14.
709 Id.; Even USPTO clarify the role of PTO which “forges a balance between the public’s interest in IP and each customer’s interest in his/her patent and trademark. It emphasizes that the PTO should pursue the public’s interest, not patent applicants’ interest. United States patent and Trademark Office, FY2002 Corporate Plan 28 (2001), available at http://www.uspto.gov/web/offices/com/corpplan/fy2002/index.html.
applicants or patent holders, and moreover, the concept of antitrust law has not been practically considered in policy decisions.

The Supreme Court in US suggested the fundamental direction about this matter. The Supreme Court which “has recognized the importance of competition conception to the patent system” to find the ideal balance between patent and competition law, has made a clear decision that patent law be interpreted as a competition policy.\textsuperscript{710} It states also that the incentive of creative innovation in patent systems is determined by free competition,\textsuperscript{711} and the patent law itself, however, already mandates a balance between encouraging innovation and preventing monopolies by limiting the duration of patent rights.\textsuperscript{712}

As other problems found in KIPO in light of diminishing questionable or invalid patents, once an application is filed, the claimed invention is effectively presumed to warrant a patent unless KIPO can prove otherwise since the presumptions in KIPO rules seem to favor the issuance of a patent and the decision “by a neutral government agency justifies placing a heavy burden on those who challenge a validity of a patent.”\textsuperscript{713}

The circumstances in KIPO, however, have many disadvantages that obstruct examiners’ efforts to decrease the issuance of questionable patents.\textsuperscript{714} First, patent examiners spend at least 1 to 3 days for an analysis of patents, searching for prior arts, an assessment of patentability, meeting or communicating with the applicant, reviewing

\textsuperscript{710} FED. TRADE COMM’N, supra note 11, at 3 and 17.
\textsuperscript{711} Id. at 3.
\textsuperscript{712} Id.
\textsuperscript{713} Id. at 9-10 (The presumptions in USPTO rules seem to favor the issuance of a patent. One of the reasoning that “clear and convincing evidence” should be applied is that the decision “by a neutral government agency justifies placing a heavy burden on those who challenge a validity of a patent”).
\textsuperscript{714} See Id. at 9.
amendments/arguments, referring the third party submission and a final decision to reject or grant a patent.

Second, patent system of KIPO does not burden an applicant to mandate the submission of prior arts beyond that about which the applicant’s knowledge, and moreover, “if the examiner does not produce a prima facie of obviousness, the applicant is under no obligation to submit evidence of nonobviousness.”715

Third, in KIPO, especially, examiners are under high pressure to examine too many patents compared to other countries. This work load leads to low quality in examinations, and specially, examiners cannot spend enough time to deal with new type of questionable patents such as blocking patents or predatory combination patents discussed above. Even though there is “Information Submissions by Third Party”716 during the prosecution of questionable patents in the OLED display industry in which patent disputes are anticipated, examiners superficially refer to the information within the limited time. Still the information provided and separate search of prior arts by examiners might be inadequate to deny or reject all material claims in the blocking patents.

B. **Problems of Patent Disputes Caused by Predatory Innovation**

Material patent holders in OLED and pharmaceutical industries insist that developing new original materials takes more than 10 years and this R&D costs are so high that very few companies are willing to make huge investments on this R&D. For the forgoing reasons, in

715 [FED. TRADE COMM’N, supra note 11, at 9.](#)

716 Article 63-2 of Korean Patent Act (“Article 63-2 is about a submission of information concerning patent applications even before the patent publication, or a ground for rejection except for an application which has been invalidated, withdrawn, or abandoned, or whose patent grant or rejection has been decided by an examiner. Any person or corporation can provide relevant evidence with a written statement of opinion to an examiner to argue that an application of the claimed invention shall not be patented”).

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the pharmaceutical and OLED markets, “evergreening”\textsuperscript{717} strategy has been used among patent holders of nearly all successful products to attempt to extend the market exclusivity beyond the length of time initially granted by the patent and to maintain their profits for as long as possible even after the expiration of their patent rights.

The argument of the material patents holders, however, cannot be justified under antitrust law because predatory combination patents as one of the evergreening strategy are blocking the panel manufacturers to combine the materials which are claimed in the invalid combination patent. Thus the panel manufacturers have to choose between the lower quality alternative materials or the expensive materials of the patented materials to make OLED panels, causing harm to both consumer and competitors.

Conventionally, economists and lawyers have strategically tried to build strong and broad patent rights to take economic progress,\textsuperscript{718} which raised concerns that “strong and broad patent rights could also build up barriers against follow-up research and, as the result, hinder technological advance.”\textsuperscript{719} Moreover, low quality patents cause infringement and litigation, and “lead to a reduction in investment and commercialization” of related innovation\textsuperscript{720} as blocking patents. Combination patents as a new patent type in the OLED display industry lead to a number of difficulties with respect to the scope of protection and

\textsuperscript{717} See Faunce, T.A. & Lexchin, J., \textit{Linkage pharmaceutical evergreening in Canada and Australia, AUSTRALIA AND NEW ZEALAND HEALTH POLICY}, 2007; Evergreening is not a formal concept of patent law. It is best understood as a social idea used to refer to the myriad ways in which pharmaceutical patent owners use the law and related regulatory processes to extend their high rent-earning intellectual property rights, otherwise known as intellectual monopoly privileges, particularly over highly profitable ‘blockbuster’ drugs. The term usually refers to threats made to competitors about a brand-name manufacturer's tactical use of pharmaceutical patents, not to extension of any particular patent over an active product ingredient.

\textsuperscript{718} Nikolaus Thumm, \textit{Patents for genetic inventions: a tool to promote technological advance or a limitation for upstream inventions?}, 25 TECHNOVATION, 1410, 1410 (2005).

\textsuperscript{719} \textit{Id.}

\textsuperscript{720} \textit{Id.} at 1416.
the assessment of patentability. Some feasible remedies should be considered for overcoming certain difficulties with this combination patents.

Even though patent law should assure companies of leeway to invent, “a predatory innovation scheme” that disguise anticompetitive invention as technically or economically improving invention should be reviewed under antitrust scrutiny in order to generate more creative innovation.\textsuperscript{721}

Now in the OLED market, there seems not a clear boundary between competitors and cooperator. Most of material makers and panel manufacturers are cooperating for research or licensing contracts each other. As a practical matter, worldwide panel manufacturers may not challenge questionable patents held by original material patent holders such as Idemitsu Kosan or UDC possess, since any try of litigation or challenging would harm their business relationship. For some material makers, filing an action against the questionable patent for invalidation of the patents would be reluctant, assuming that they are material suppliers for the panel makers, so the action would adversely effect on the relationship with the panel makers, and also, the relationship between the panel makers with original material patent holders. Nevertheless, few Korean material makers and global material firms are trying to challenge the questionable patent of Idemitsu Kosan or UDC, and the invalidation law suits are pending in Korea, Japan and Europe.

In light of the mentioned problem, instead of a hostile action through an invalidation lawsuit of the questionable patents, many firms seem to select the way of licensing the questionable patents\textsuperscript{722} because the firms do not want to burden any possible risks in their

\textsuperscript{721} Baskin, \textit{supra} 3, at 1755.

\textsuperscript{722} \textit{FED. TRADE COMM’N, supra} note 11, at 18.
business and financially expensive legal challenges either, which may give advantages to “all of the affected firms, not just the challenger.”

The growth of patents in amounts and increasing broad claims do not insure “always the best way to maximize consumers’ welfare in industries.” Consequently, the questionable or invalid patents and blocking patents as predatory innovation may raise R&D costs and prevent free competition and improved innovation “that otherwise would benefit consumers.”

**C. RAISING THE NECESSITY OF HARMONIZATION OF PATENT SYSTEM AND ANTITRUST LAW**

As discussed in previous Chapter 6, it is true that issuance of patents and free competition in the market have significantly contributed to new valid innovation, consumers’ welfare and development of industry. That is to say, granted patents trigger and help subsequent creative and improved innovation, and at the same time, free competition is also a very important factor for encouraging productive innovation like a causal cycle.

OLED material patent holders have powerful incentives to pursue a variety of strategies for extending patent life and market power. Such strategies, however, have drawn antitrust scrutiny as we discussed in Chapter 6.

When patent system and antitrust policy lie in the appropriate balance, consumers and innovators can find benefits. Patent law, however, cannot appropriately regulate anticompetitive conducts because it is not “fundamentally designed to police and punish

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723 *Id.*  
724 *See Id.*  
725 *Id.*  
726 *Id.*  
727 *Id.* at 2-3.
patent holders: rather, it focuses primarily on policing and punishing infringers.”

Examples, an “invalidity defense” in an invalidation trial does not remedy detriments caused from the invalid patent for alleged infringers. Moreover, “patent law does not provide causes of action to those injured by the misconduct of patentees (unless the alleged infringer has its own patent that it can sue on),” because “the victims of invalid patents are generally consumers and licensees who have no IP rights.” To solve this problem, patent system should consider introduction of antitrust law to effort together against enforcing invalid patent rights and fraud because “effective antitrust enforcement” shall “reinforce the goals of the patent system” without interference of patent policy.

Such harmonizing patent rights and antitrust laws was tried by KFTC as notifying “Review Guidelines on Unlawful Exercise of Intellectual Property” concerning unfair business practices as well as anticompetitive conducts by enforcement of patent rights beyond legitimate region, even though the guidelines were not practically enforceable.

MRFTA of KTFC codifies regulations concerning unfair business practices additionally, compared to the antitrust regulation of USFTC where real market is competitive with no barriers to entry, due to the following reasons. In Korean industry markets, it is not easy to find prospective competitors since the market has a rigid structure with high barriers to entry, and vertical relationship between dominant firms with market power and subordinate small companies dominates the market, rather than horizontal relationship. Thus,

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728 Leslie, supra note 15, at 1285.
729 Id. at 1273.
730 Id. at 1285-1286.
731 Cho, supra note 556, at 101.
regulations against unfair trade would be complementary rules to punish the anticompetitive conduct by dominant firms.\footnote{Oh, supra note 551.}

Therefore, more than ever, a close collaboration between Patent Institution and Antitrust Agencies, and reinforcement of antitrust regulatory influence on the patent system are demanding.

II. PROPOSAL FOR HARMONIZATION OF PATENT SYSTEM AND ANTITRUST LAW

A. PROPOSAL 1: ESTABLISHING A COOPERATIVE ORGANIZATION FOR HARMONIZATION OF PATENT SYSTEM AND ANTITRUST LAW

For the best solution, a novel application of US Antitrust regulations to specific anticompetitive conducts including predatory innovation as a new enforcement practice of IP rights should be introduced as practically codified forms in IP Guidelines under MRFTA.\footnote{Id. at 160; Choi, supra note 550, at 127.} Then, KFTC might enforce a violation of Antitrust Law to patent holders of the questionable or blocking patents, specially, as predatory innovation under IP Guidelines of MRFTA.

At the same time, KFTC may file an invalidation lawsuit before the KIPO Tribunal with “preponderance of evidence”\footnote{See FED. TRADE COMM’N, supra note 11, at 10 (“An issued patent is presumed valid…Presumptions and procedures that favor the grant of a patent application, combined with the limited resources available to the PTO, counsel against requiring ‘clear and convincing evidence’ to overturn that presumption. We believe the ‘clear and convincing evidence’ burden can undermine the ability of the court system to weed out questionable patents, and therefore we recommend that legislation be enacted to amend the burden to a ‘preponderance of the evidence’”).} as a neutral third party or an enforcement agency, and take the responsibility for the “cost of questionable patent to an entire industry and to customers to solve this coordination problem.”\footnote{FED. TRADE COMM’N, supra note 11, at 18.} This kind of involvement of KFTC should
be limited to the antitrust conducts which are not related to an infringement lawsuit brought by a questionable patent holder because a defendant can bring a patent invalidation action as a defense against an infringement lawsuit. For KFTC to play a role of the challenger, more cooperation and “communication between the Antitrust Agencies and Patent Institutions” should be established.\textsuperscript{736}

The reason why KIPO has not paid attention to antitrust law or competition law as much as the patent system and the concept of antitrust law is not practically considered in policy decisions is that only KTFC take care of antitrust issues separately from KIPO even though antitrust law and patent rights have common economic goals of encouraging innovation and maximizing consumer’s welfare.

Under the proposal suggested by commission (FTC),\textsuperscript{737} if an organization is established for communication and cooperation between Antitrust agents and The Patent Office, such organization could act an cooperator to counsel policymakers of The Patent Office about the “likely competitive impact and economic consequences of the policy decisions” and patent examination.\textsuperscript{738} Specially, when an invalidation lawsuit is related to antitrust law issues or in the opposite case that antitrust issues caused from questionable patents are related to the invalidation lawsuit, this organization could solve the antitrust issues efficiently, and thus significantly impede “anticompetitive and meritless” predatory innovation.\textsuperscript{739}

\textsuperscript{736} Id. at 17.
\textsuperscript{737} Id. at 1, 18.
\textsuperscript{738} Id.
\textsuperscript{739} Id.; See Baskin, supra note 3, at 1755.
B. PROPOSAL 2: KTFC REPORTING SYSTEM FOR SOLUTION OF OLED PATENT DISPUTES

Recently, KFTC started investigation into intellectual property right abuse by multinational originators and generic companies, focusing on whether originators have abused their legally protected IP rights by extending beyond the protected scope of such rights, resulting in delays in generic entry and, in turn, burdening customers with higher price.\textsuperscript{740}

The KFTC has surveyed also patent-infringement lawsuits more than 50 cases filed by multinational companies against Korean generic companies to enforce an action against violation of Antitrust Law by “evergreening” conducts including predatory innovation, sham litigation, settlement and reverse payment agreements.\textsuperscript{741}

In 2014, KFTC announced their plan for launching a reporting system for enhancing the regulation of patent dispute settlements in pharmaceutical industries according to the drug approval-patent linkage system. Under this reporting system, pharmaceutical companies should report the settlement of a drug patent infringement disputes to KTFC, and, upon review, KTFC enforces legal measures to anticompetitive settlement. This monitoring system followed the regulation by the Hatch-Waxman Act in USFTC and application of competition law by European Commission.\textsuperscript{742}

Likewise, for OLED display industries, KTFC should adopt such the reporting system to monitor, regulate and penalize the patent misuse and anticompetitive conducts by abuse of

\textsuperscript{740} Jiyul Yoo & Young Sun Cho, Settlement of drug patent dispute to be reported to the KFTC, Yoon & Yang LLC (Mar. 12, 2014), available at http://www.lexology.com/library/detail.aspx?g=27d53a33-e1df-4bf5-8bc1-c4a8c10fd11e.
\textsuperscript{741} Id.
\textsuperscript{742} Id.
market-dominating position. Such the reporting system, combined with the inter-organization cooperation between KTFC and KIPO will decrease meritless infringement litigations and anticompetitive settlement agreements under Section 1 of the Sherman Act.

III. PROPOSAL: REFORMATION OF PATENT SYSTEM AND TF (TASK FORCE) TEAM ORGANIZATION FOR DIMINISHING QUESTIONABLE OR INVALID PATENTS

To overcome the problem of procedures in patent prosecution, USPTO enacted The America Invents Act (AIA) recently, introducing a new system to find a legal means to invalidate questionable patents. Before the reform, the examination procedures in USPTO permit participation by third parties very limitedly through a reexamination procedure, and moreover, even in federal court, a competitor may not file a lawsuit to challenge the validity of the targeted patent unless the patent owner has threatened the competitor with infringement litigation.

“Third Party Submissions” in AIA which is a similar system with the KIPO’s “Information Submissions by Third Party,” allows a third party to submit relevant documents along with comments or analysis after at least patent publication, which had not been included in the previous Act. On the other hand, recently reformed “Information

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743 See Janis, et al., supra note 569, at 1720.
745 35 U.S.C. § 122(e) of AIA (“35 U.S.C. 122(e) provides a mechanism for third parties to submit patents, published patent applications, or other printed publications of potential relevance to the examination of a patent application with a concise description of the asserted relevance of each document submitted. Under 35 U.S.C. § 122(e), such submissions may be made before (1) the later of (i) 6 months after the date of publication or (ii) the date of a first Office action on the merits rejecting any claims, or (2) before the date of a notice of allowance, if earlier.” Available at http://www.uspto.gov/patents/init_events/preissuance_submissions.jsp.).
Submissions by Third Party” to expand the opportunity of the submission in the KIPO allows the submission even before the publication and all prosecution processes including the reexamination process.

To reduce the cost for invalidation litigation in court, the AIA\textsuperscript{747} provides “Post-Grant Review”\textsuperscript{748} and “Inter Partes Review”\textsuperscript{749} along with the “Third Party Submissions.” According to the AIA, “preponderance of the evidence” is applied for the assessment of “Post-Grant Review,” “Inter Partes Review” and “Reexamination”\textsuperscript{750} in the board of USPTO. The burden of proof of “clear and convincing evidence” is, however, still applied for the appeal of the reviews in the Federal Court.\textsuperscript{751} The two procedures of “Post-Grant Review”\textsuperscript{747}

\textsuperscript{747} Patent Reform Act, supra note 744 and accompanying text.

\textsuperscript{748} AIA Sec. 6(d) §321-329 (“§ 321 (a) In General: Subject to the provisions of this chapter, a person who is not the owner of a patent may file with the Office a petition to institute a post-grant review of the patent. The Director shall establish, by regulation, fees to be paid by the person requesting the review, in such amounts as the Director determines to be reasonable, considering the aggregate costs of the post-grant review. (b) Scope: A petioner in a post-grant review may request to cancel as unpatentable 1 or more claims of a patent on any ground that could be raised under paragraph (2) or (3) of section 282(b) (relating to invalidity of the patent or any claim). (c) Filing Deadline: A petition for a post-grant review may only be filed not later than the date that is 9 months after the date of the grant of the patent or of the issuance of a reissue patent (as the case may be”).

\textsuperscript{749} AIA Sec. 6(a) §311-319 (“§ 311 (a) In General: Subject to the provisions of this chapter, a person who is not the owner of a patent may file with the Office a petition to institute an inter partes review of the patent. The Director shall establish, by regulation, fees to be paid by the person requesting the review, in such amounts as the Director determines to be reasonable, considering the aggregate costs of the review. (b) Scope: A petitioner in an inter partes review may request to cancel as unpatentable 1 or more claims of a patent only on a ground that could be raised under section 102 or 103 and only on the basis of prior art consisting of patents or printed publications. (c) Filing Deadline: A petition for inter partes review shall be filed after the later of either (1) the date that is 9 months after the grant of a patent or issuance of a reissue of a patent; or (2) if a post-grant review is instituted under chapter 32, the date of the termination of such post-grant review”).

\textsuperscript{750} 35 U.S.C. § 302 (“Request for reexamination. Any person at any time may file a request for reexamination by the Office of any claim of a patent on the basis of any prior art cited under the provisions of section 301. The request must be in writing and must be accompanied by payment of a reexamination fee established by the Director pursuant to the provisions of section 41. The request must set forth the pertinence and manner of applying cited prior art to every claim for which reexamination is requested. Unless the requesting person is the owner of the patent, the Director promptly will send a copy of the request to the owner of record of the patent”).

\textsuperscript{751} Patent Reform Act, supra note 744 and accompanying text.
and “Inter Partes Review” are corresponding to invalidation lawsuits to which previous opposition proceedings are merged in Korean Patent Tribunal.

Eventually, these Reform Acts were established meaningfully for increasing efficiencies of examination and issuance processes, and decreasing invalid patents or predatory invention.

Additionally, an organization of TF team composed of expertise, examiner or judge corresponding to the request of a third party informer or a prospective plaintiff of antitrust litigation, would be appropriate solution for fair and unified examination and trial (invalidation trial and appeal against rejection decision) in KIPO, and thus, it eventually reduce doubtable patents regarding patent misuse, anticompetitive predatory invention, or anticipated patent disputes around material patents between final product firms and material firms.

IV. PROPOSAL: STANDARDS OF PATENTABILITY REGARDING OBVIOUSNESS OF COMBINATION INVENTION BY UNIFORM AND EFFECTIVE PATENT SYSTEM

Many related articles have already discussed post-KSR focusing on the economic effect and regulations around the market, and alleged that different standards should be established for the patentability of predatory innovation that have injured competitors exercising real improvement innovation.

On the other hand, some critics advocating original patent holders have claimed the need to reevaluate litigation and patenting strategy in view of post-KSR since the new strict
standard of obviousness was made in KSR case\textsuperscript{752} while FTA strengthens the original patent holder’s rights.\textsuperscript{753}

In 2007, a US Supreme Court decision in KSR may raise the standards for all patent applicants and holders for patentability. The US Supreme Court mandated a more expansive and flexible approach towards a determination as to whether a patent is obvious and invalid. This ruling may make it more difficult for patent holders to secure or maintain existing patents, or to obtain additional patents in the future.\textsuperscript{754}

Moreover, if the Supreme Court’s decision acts \textit{stare decisis} over the independent judgment of the Federal Circuit, the Teleflex decision makes the standard for proving obviousness lower so that the defense of invalidating contested patents shall have a strong legal basis in infringement litigation.\textsuperscript{755}

The flexible validity inquiry in KSR also provides balances between “the number of potential solutions, the innovative steps used to create the patented product, and what was obvious to a skilled person at the time.”\textsuperscript{756}

Presumably, the Supreme Court’s decision in KSR would be the solution to find equitable assessment standard of obviousness generally covering predatory invention and real

\textsuperscript{752} See KSR, 550 U.S. 398, at 415 (“We begin by rejecting the rigid approach of the Court of Appeals. Throughout this Court’s engagement with the question of obviousness, our cases have set forth an expansive and flexible approach inconsistent with the way the Court of Appeals applied its TSM test here. To be sure, Graham recognized the need for uniformity and definiteness. Yet the principles laid down in Graham reaffirmed the functional approach of Hotchkiss. To this end, Graham set forth a broad inquiry and invited courts, where appropriate, to look at any secondary considerations that would prove instructive”).


\textsuperscript{754} Universal Display Corporation, \textit{supra} note 2.

\textsuperscript{755} Faga, \textit{supra} note 107, at 495 (citing Lateef & Stowell, \textit{supra} note 666).

\textsuperscript{756} Zullow & Brook, \textit{supra} note 262, at 5-6.
improvement invention. The standards of the decision would provide underlying rationales for differentiation of genuine invention from predatory invention.

Virtually, the *KSR* case turned out to be a meaningful turning point in judgment of anticompetitive patent strategies like predatory innovation by combination patenting or blocking patenting in that the case built reliable standards for assessment of obviousness and generated positive effects as follows.

**A. FUNCTIONAL SYNERGY TEST**

As discussed in Chapter 3, the standards for assessment of obviousness in four countries of US, KR, JP and EU after *KSR* are comprised of similar factors.

In the Supreme Court’s decision in *KSR*, the key factor was “functional synergy” test demanding that the “whole combination of prior elements be greater than the sum of its parts,” and the test is similar to the standard of “a functional synergistic effect” of the KIPO, “functional reciprocity” of the EPO, and “advantageous effects” of the JPO.

In light of the Supreme Court’s decision in *KSR*, reinforcing its principle reason for rejecting combination patent claims for accessing obviousness, the Idemitsu’s combination patent claim should be invalid as obvious because the combination of well-known OLED materials used for the fabrication of OLED panel “with no change in their functions” is “within the grasp of a person of ordinary skill in the relevant art.” Since the broad Supreme Court’s test made it difficult to prove non-obviousness for granting patents and keep the

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759 See Faga, *supra* note 107, at 494; *KSR*, 127 S. Ct. at 1739 (“[A] patent for combination which only unites old elements with no change in their respective functions…obviously withdraws what is already known into the field of its monopoly and diminishes the resources available to skillful men”).
760 *KSR*, 127 S. Ct. at 1739.
validity of patents based on the combination of known elements, only truly innovative invention might pass the threshold of test to be held valid.761

B. ECONOMIC SYNERGY TEST

After KSR, some alternative theories were suggested to adjust the level of the obviousness standard between the Supreme Court and the Federal Court. As an alternative to the high standard of obviousness, the standard of “economic synergy” was suggested, where the “economic synergy” standard, allegedly, is superior than the “functional synergy” test in that all functionally synergistic combination patents have “economic synergy,” but if the combination patent has economic value, it could be nonobvious even though the combination patent does not show “functional synergy.”762

The underlying rationale of the standard of “economic synergy” is that patents having economic value can provide economic incentive to innovators, and standards for patentability should be economically balanced between effects of the patent monopoly right and the public benefit coming from the patent disclosure, thus the standards of Supreme Court should be expended “beyond functional synergy to encompass economic synergy.”763

Upon deciding that suggestion to combine is not found in the prior art, examiner should consider whether the combination promotes economic process as the next step because the economic synergy test makes the bar for obviousness from the strictness of the

761 Faga, supra note 107, at 495.
762 Packin, supra note 246.
763 Id.
functional synergy test lower, “while maintaining predictability, uniformity, and consistency with constitutional standard.”

Likewise, under the Korean Patent Act, Article 1 states the purpose of patent act is “to encourage, protect and utilize inventions, hereby improving and developing technology, and to contribute to the development of industry.” That is to say, the purpose of the patent or the expected contribution of the patent is the development of industry, and “development of industry” may be ultimately equal to the meaning of “economic synergy” effect.

C. COMMON SENSE TEST

Just after the Supreme Court’s KSR decision, Federal Circuit did not use the strict TSM test on assessing obviousness, and instead relied on the Supreme Court’s KSR decision that considered what is known to one of ordinary skill in the art, so called, “common knowledge” and “common sense” to determine whether a patent claim is obvious.

The Supreme Court’s decision set forth the “common sense test” of a person having ordinary skill in the relevant art which acted an underlying standard for the assessment of functional synergy after applying Graham test in the first prong.

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764 Cotropia, supra note 151. The Supreme Court instructed a flexible approach to nonobviousness inquiry and introduced two types of “predictability” criteria. “Type I predictability” is “predictability of use” that is whether the improvement is more than the predictable use of prior art elements according to their established functions,” or “whether the combination is predictable.” KSR, 550 U.S. at 417. “Type II predictability” is “predictability of the result” that is whether the combination yields predictable results. In KSR, the Court indicated that “when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.” Id. at 416.

765 Packin, supra note 246.
767 Evans, supra note 154, at 689.
768 KSR, 127 S. Ct. at 1742; Mueller, supra note 159 and accompanying text.
769 Milton & Anderson, supra note 173.
770 Evans, supra note 154, at 691-692 (quoting Milton & Anderson, supra note 173).
According to the common sense test, if the selection and combination of elements from more than two prior arts does not show functional change, the combination shall fall into something obvious that a person having ordinary skill in the relevant art would make as a matter of common sense. On the other hand, “it would not be a matter of common sense to include a new element or produce a new function or unpredictable result”, and therefore, such a combination shall be nonobvious to be patentable.771

D. UNIFORM AND EFFECTIVE PATENT SYSTEM

The most prominent influence of the KSR case is that the Supreme Court’s decision established uniform and effective patent system with evolving technology through encouraging true innovation.

The Supreme Court reversed the Federal Court’s decision for an attempt to maintain the uniformity and predictability of the patent litigation, ensuring that the patent system should evolve flexibly following the demands of the constantly changing technological modern world of technology772 as well as be predictable as reliable guidelines.773

The decision made the patent system strong “by focusing on novelty for patentability rather than unpatentable combinations of ‘old elements with no change in their respective

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771 Id. (quoting Milton & Anderson, supra note 173).
772 Evans, supra note 154, at 674 (quoting DONALDS. CHISUM ET AL., PRINCIPLES OF PATENT LAW: CASES AND MATERIALS 3 (3d ed. 2004) (1998). “As stated, a patent is a grant issued by the government that gives the patent owner ‘the right to exclude others’ from practicing the invention. Id. That right is applied retroactively to an issued patent and runs from the date that the patent application was filed to twenty years from the date that the patent issued. Id. ‘In return for obtaining this grant, an inventor must describe her invention in some detail so as to give notice to the public and to enable one of ordinary skill in the art to which the invention pertains to make and use the invention.’ Id.”).
773 Evans, supra note 154, at 669-670; KSR, 550 U.S. at 415 (“rejecting the rigid approach of the Court of Appeals...throughout this Court’s engagement with the question of obviousness, our cases have set forth an expansive and flexible approach inconsistent with the way the Court of Appeals applied its TSM test here”).
functions." Practically, the Supreme court decision allows more flexibility approach in determination of obviousness since “adherence to a particular standard” consistently shall be “less important than promoting the goals of the patent system: encouraging innovation and rewarding useful developments.” After KSR, although federal court still uses the TSM test as a secondary factor, the test does not act any more as the major barrier.

However, the purpose of the decision lies in promoting “uniformity and definiteness” among district courts and Federal Circuit in the patent system, ensuring that the courts would follow “the same analysis as the Supreme Court and remain faithful to the Court’s precedent.” In the past, it was not easy “to predict the strength of a patent” such that reliable prediction of the outcome of patent litigation before Federal Circuit was impossible. The Supreme Court’s decision, eventually, provided guidance for judges and attorneys to predict the “outcome of the patent litigation” such that the “reversal rate of Federal Circuit” should be decreased on appeal.

E. PREVENTION OF PATENT STRATEGY VIOLATING ANTITRUST LAW

Another advantage brought by the KSR case is that it generates economical effect of preventing patent strategy violating antitrust law.

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775 Evans, supra note 154, at 692 (“According to the Supreme Court, patent law serves three primary purposes: 1) to promote and reward creativity and innovation, 2) to foster disclosure of inventions so that others are inspired to further creativity and so the public may use the invention upon the expiration of the patent, and 3) to ensure that information already in the public domain remains free for all to use by enforcing strict requirements to achieve patent protection.” quoting Arson v. Quick Point Pencil Co., 440 U.S. 257, 262 (1979)).
776 Evans, supra note 154, at 692-623.
777 Id. at 693 (quoting KSR, 550 U.S. 398, at 415).
778 Evans, supra note 154, at 693.
779 Id.
780 Id. (quoting Craig Allan Nard & John F. Duffy, Rethinking Patent Law’s Uniformity Principle, 101 NW. U. L. REV. 1619, 1620-21 (2007). “Indeed, the establishment of the Federal Circuit as the uniform court for patent appeals is often perceived as the root of all problems in patent litigation. Id. The Federal Circuit has been blamed for increasing the cost of patent litigation, heightening the burdens of the patent administration, promoting free-riding activities, and increasing the uncertainty and unpredictability of patent litigation. Id.”).
Evans, however, suggested in the review that the Supreme Court’s decision was sending a warning to “patent trolls” by reversing the TSM test with “the effect of taking an ‘obvious step towards fighting the patent trolls’” which have taken “advantage of the low nonobviousness standard the Federal Circuit established in its application of the TSM test ‘by acquiring patents on inventions that were obvious because getting a patent application to issue based on the teaching, suggestion, motivation standard of obviousness was simply too easy.’”

As discussed in case studies in Chapter 3, the TSM test lowered the threshold to grant combination patents that should not have been granted because they were trivial or obvious over the prior art.

Before the KSR, under this Federal Circuit’s low obviousness requirement in view of the level of ordinary skill and common sense, originators having market power had easily increased its patent portfolios by strategic combinations of technical features in prior arts for several purposes. The strategic patenting was fabricated for the expectation of that the combination patent would be valuable to solve a future technical problem, or for an evergreening goal to extend their market power in the market by creating second generation of original patents. The most prevailing object might be making a “future barrier” to true innovation to solve the problem.

781 Todd Klein, Comment, Ebay v. Mercexchange and KSR Int’l Co. v. Teleflex, Inc.: The Supreme Court Wages War Against Patent Trolls, 112 PENN. ST. L. REV. 295-296 (2007) (Klein defines “patent trolls” as “non-manufacturing patent owners who are either individuals or companies that purchase patents and assert them with no intention of creating or manufacturing a product using the patented technology”).
782 Evans, supra note 154, at 695-696 (quoting Klein, supra note 781, at 310-311).
783 See Klein, supra note 781, at 311.
784 Packin, supra note 246, at 977.
Under such circumstances, the originators, original patent holders, have taken advantages of a loophole in the patent system which has not been unified and consistent, specially, on the assessment of combination patents under the Federal Circuit’s TSM test.

This patent system has encouraged originators to put together old elements to new combinations, instead of devoting theirs efforts to solve problems in order that they would act future barriers to competitors who enter the market by solving the problem. Another issue is that originators are on purpose producing combination patents like “landmines” on which the genuine innovators or competitors will step. Such system and action must be “a misdirection of technical resources,” triggering increase of “the transaction costs” of the innovation system “without any compensating incentives” for innovation to promote the progress of the relevant art.

The mistake of Federal Court is that it did not consider common sense by a person having ordinary skill in the art since applying common sense to obviousness inquiry would “allow an accused infringer to show that the activity at issue was anticipated by developments in the field that would therefore invalidate the patent based on obviousness and render the activity non-infringing.”

V. PROPOSAL: REFORMATION OF THE PATENT EXAMINATION GUIDELINE

As we discussed above, originally, even though TSM test was introduced by Federal Court to uniform the standard of assessing obviousness in the application of Graham, it

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786 Id. at 12-13.
787 Id. at 13.
788 Id. at 12-13.
789 Evans, supra note 154, at 689 (quoting Steven J. Lee & Jeffrey M. Butler, Teaching, Suggestion and Motivation: KSR v. Teleflex and the Chemical Arts, 17 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 922 (2007)).
790 Canaan, supra note 156.
could not follow the technological development, and moreover, it was abused by patent troll and patent ever-greening strategy. To preclude these harmful effects, the patent system should pursue uniformity and, at the same time, flexibility in view of pro-consumer, not pro-patentee. In addition, establishment of impartial standards of patentability following the Supreme Court’s decision in KSR, should be made by following suggestions.

First, considering equitable assessment standards of obviousness generally covering predatory invention and real improvement invention, the present standards of obviousness are still focused on TSM test and, specially, trial decisions by the Korean Patent Tribunal have rigidly applied TSM as the first prong based on Formfactor case without further consideration of other factors such as close relation of technical fields, advantageous effects, a functional synergistic effect and secondary effects for assessment of combination patents. But if KIPO would revise the Patent Examination Guideline to apply Supreme Court’s decision in KSR for the standard of assessing combination patents, prior to TSM test, application of functional synergy test and, at the same time, Graham test along with examining relevant secondary factors would efficiently discriminate against predatory invention.

Second, especially, in considering a functional synergistic effect or unexpected results during an assessment, a distinctive and objective standard should be established for

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791 Evans, supra note 154, at 674.
792 Evans, supra note 154, at 695-696 (quoting Klein, supra note 781, at 310-311).
793 In Formfactor, the decision adopted the TSM test as the first prong of the standards for assessment and, as the second prong, taken into account the state of the art, the common general knowledge at the time of filing, the general technical problems of the technical field, the technical trend and demands in the industry, if the combination of prior art disclosure is deemed to be easily made by a person skilled in the art, the examiner can deny the inventive step of the claimed invention. Case cited supra note 197.
794 Such as commercial success, long-felt (unreserved needs), failure of others, and surprising/unexpected results. Graham, 383 U.S. at 17.
each diverse technical field. Additionally, requirement of stating the detailed description of the invention also should be articulated in the standards considering characteristics according to technical field. The rational of such suggestion lies in that the patent system influences differently on different industries, and thus, patents in different technical fields should be assessed by distinctive specific standards by building concrete and predictable assessment standards in KIPO, just like pharmaceutical invention.

In OLED area, discrepancy between the result of patent examination and that of trials such as invalidation trial and appeal against rejection decision has been generated due to the discordance of standards in assessment of a functional synergistic effect or unexpected results of combination invention. For example, almost combination invention insists that luminance efficiency of claimed OLED devices or materials is prominently better than that of prior arts by simple numerical comparison of one factor like luminance efficiency. This luminance effect, however, should be compared based on same factors between the claimed invention and prior arts, such as applied current, voltage, fabrication conditions and other layer materials of OLED device except claimed material. Moreover, the detailed description of the invention should illustrate precise comparison data of luminance efficiency or other critical factors. That is to say, the Patent Examination Guideline should articulate the mentioned description methods and the requirement of stating concrete functional synergistic effects or unexpected results along with comparison data in the detailed description of combination or

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795 See Janis, et al., supra note 569, at 1738.
796 The test data of medicinal effect of a drug composition or a medicine should be described in the detailed description of the pharmaceutical invention. Patent Examination Guideline (2013) of KIPO.
broad claimed invention related to OLED technology field.\textsuperscript{797} This kind of stipulation, virtually, makes the regulation of Article 42(4)(2), 42(4)(1)\textsuperscript{798} and 42(3)\textsuperscript{799} of the Patent Act strong, so that it would prevent anticompetitive patenting and protect genuine innovation.

In light of the standards as mentioned above, since the OLED device is fabricated by combinations of several layers of materials, each material firm developing some kinds of new materials must use other firm’s material to test the performance of the new materials embedded in the fabricated device. Therefore, material firms inevitably should build complementary cooperation with each other between device manufacturer and material firms, and even between material firms, although superficially, they have competitive relationships. These twofold aspects presumably come from the specific characteristic of this OLED market. The combination of previously known OLED materials to achieve the same function without unexpected advantage effect shall be a predictable result, founded obvious, in light of appropriate common sense by a person having ordinary skill in the art. Materials and devices showing improved efficiencies or unexpected advantageous effect in the course of solving the technical problem deserve only true innovation, which should be differentiated from predatory innovation or blocking patents.

\textsuperscript{797} This requirement of stating the detailed description is similar to the requirement of stating medical effect of medicinal use claims in pharmaceutical patents.

\textsuperscript{798} Article 42 of the patent Act specifies the requirement of stating the detailed description of the invention and the claims. Patent Examination Guideline, supra note 441 and accompanying text. Patent Examination Guideline, supra note 442 and accompanying text.

\textsuperscript{799} Patent Examination Guideline (2013) (“Article 42(3) of the Patent Act (Requirements for Patent Registration) Detailed Descriptions of an invention shall satisfy the following Enablement requirement: Descriptions of an invention shall be provided in accordance with the methods prescribed by Ordinance of the Ministry of knowledge Economy in a clear and detailed manner to ensure that any person with ordinary knowledge in the art to which the relevant invention pertains can easily understands the concerned invention. This means that a clear and precise description of the invention should lead a person skilled in the art to easily work the invention based on the technical knowledge, specification and drawing at the time of filing the application”).
CHAPTER EIGHT  CONCLUSION

This dissertation explores the “current regulatory framework” for patent strategies in the OLED display industry in the course of patent examination, invalidation trials and applying antitrust liability to a “predatory innovation scheme.”

In UDC’s invalidation cases, hypothetically, if the patentee (UDC) and the challenger (Duksan Hi-Metal) reach an agreement in order to conceal UDC’s invalid patents in the patent invalidation proceeding, that settlement agreement shall be subject to Section 1 liability of the Sherman Act. Likewise, in the light of Korea IP Guidelines of KTFC, if parties make an agreement even though two parties know that the patent in dispute is invalid, such conduct shall be a violation of Article 19 (Prohibition on Unfair Collaborative Practices) of the MRFTA as well as constitution of patent misuse.

Furthermore, if the predatory innovation such as the broad claimed UDC’s patents and the combination patents of Idemitsu Kosan restricts the competition or actually monopolizes the relevant market, such conduct shall be subject to Section 2 of the Sherman Act as monopolization or attempted monopolization with considering two prongs of the dominant firms’ blocking intent and the patent’s validity. In addition, hypothetically, if the predatory innovation is exercised with any enforcement of patent rights like threats or warning of infringement litigation by the dominant firms with intent to unfairly control the relevant market, that conduct would constitute patent misuse.

Ultimate goal of Antitrust Law codified in the Sherman Act and the FTC Act, and Patent Law is to improve true innovation and to maximize consumer welfare by encouraging

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800 Baskin, supra note 3, at 1755.
firms’ competition.\textsuperscript{802} However, there are some difficulties in applying antitrust laws (or competition laws) to new OLED technology industry for the clarification of restrictive, exclusive or anticompetitive conducts, while not over-regulating the economic activities including patent rights enforcements. Nevertheless, reducing anticompetitive predatory innovation and patent disputes in OLED industry, and thereby, encouraging free competition to enter into the OLED industry market without anticompetitive coercions by dominant firms is the best way to substantialize the goal.\textsuperscript{803}

To achieve this goal, it shall be the best solution to reinforce antitrust regulatory influence on the patent system and to harmonize Patent System and Antitrust Law by (1) introduction of US Antitrust Law to IP Guidelines under MRFTA of KTFC to regulate anticompetitive conducts including predatory innovation, (2) filing an invalidation lawsuit by KTFC itself to KIPO Tribunal, (3) establishment of an organization for communication and cooperation between Antitrust agents and The Patent Office, or (4) adoption of KTFC reporting system\textsuperscript{804} in order to monitor, regulate and penalize the patent misuse and anticompetitive conducts in OLED industry.

As for a systematic solution, the patent system reformation (AIA) of USPTO and the foundation of TF team where expertise, examiner or judge could cooperate for consultation of examination or trial on the questionable case, could realize fair and uniform patent examination and trial process, and thereby, diminishing predatory or invalid patents.

\textsuperscript{802} Supra note 11, at 1.
\textsuperscript{803} See Baskin, supra note 3, at 1729.
\textsuperscript{804} Yoo & Cho, supra note 740.
In the limited sense, Formfactor case\textsuperscript{805} set up concrete obviousness standards of combination invention in KIPO, nonetheless, the standards erred in applying TSM test primarily, and as the result, some trial decision have been still based on rigid TSM test mainly. Under such circumstance, this dissertation reasonably concludes that the Supreme Court’s decision in \textit{KSR}\textsuperscript{806} would be the ideal solution to find equitable assessment standard of obviousness providing underlying rationales for differentiation of genuine invention from predatory invention. Under this proposal, application of functional synergy test or unexpected results\textsuperscript{807} along with \textit{Graham} test\textsuperscript{808} as the first assessment is strongly recommended for a reconstruction of obviousness standards.

As a practical matter, for combination or broad claimed invention related to OLED technology field, the requirement of stating concrete functional synergistic effects or unexpected results along with comparison data in the detailed description of the invention (written description), and the manner and process of making and using it (enablement) should be reinforced by articulation in the Patent Examination Guideline.

Virtually, the Supreme Court’s decision in \textit{KSR} turned out to be a meaningful turning point in judgment of anticompetitive patent strategies like predatory innovation premised on a theory that the Supreme Court’s decision generated economical effect of precluding patent

\textsuperscript{805} Case cited supra note 197.
\textsuperscript{806} \textit{KSR}, 550 U.S. at 398; Faga, supra note 107.
\textsuperscript{807} As one of the secondary factors, case cited supra note 794 and accompanying text.
\textsuperscript{808} Evans, supra note 154 (“The Court in \textit{Graham} established a bare bones standard for determining whether an invention satisfied the obviousness standard, but made it clear that this was a guideline open for future interpretation…The Graham court established a four-step procedure to assess the obviousness and corresponding validity of a patent: 1) determine the scope and content of prior art; 2) determine the level of ordinary skill in the art; 3) compare the differences between the claimed invention and the prior art; and 4) assess in relation to any objective indicators of obviousness (secondary considerations such as a long-felt but unresolved need for the invention, the failure of others to make the invention, and commercial success)” (citing \textit{Graham}, 383 U.S. at 17-18).
strategy violating antitrust liability by raising the threshold of obviousness requirement and
common sense, and also it established the balance between the competing goals of the
innovation and the monopoly from genuine innovations.\textsuperscript{809}

\textsuperscript{809} Faga, supra note 107, at 498; See KSR, 127 S. Ct. at 1727, 1743.
APPENDICES

KFTC REGULATION

1. Source of Regulations

2. Articles

Article 1. Purpose
The purpose of this Act is to promote fair and free competition, to thereby encourage creative enterprising activities, to protect consumers, and to strive for balanced development of the national economy by preventing the abuse of market-dominating positions by enterprisers and the excessive concentration of economic power, and by regulating undue collaborative acts and unfair business practices.

Article 3-2. Prohibition of Abuse of Market-Dominating Position
(1) No market-dominating enterpriser shall commit acts falling under any of the following subparagraphs (hereinafter referred to as "abusive acts"):  
1. An act determining, maintaining, or changing unreasonably the price of commodities or services (hereinafter referred to as the "price");
2. An act unreasonably controlling the sale of commodities or provision of services;
3. An act unreasonably interfering with the business activities of other enterprisers;
4. An act unreasonably impeding the participation of new competitors; and
5. An act unfairly excluding competitive enterprisers, or which might considerably harm the interests of consumers.

(2) Categories or standards for abusive acts shall be determined by Presidential Decree.

Article 19. Prohibition of Improper Concerted Acts

(1) No enterpriser shall agree with other enterprisers by contract, agreement, resolution, or any other means to jointly engage in an act, or let others do this kind of activities, falling under any of the following subparagraphs, that unfairly restricts competition (hereafter referred to as "improper concerted acts"):

1. An act fixing, maintaining, or changing prices;
2. An act determining terms and conditions for transactions of goods or services, or payment of prices thereof;
3. An act restricting production, delivery, transportation, or transaction of goods or services;
4. An act limiting the territory of trade or customers;
5. An act preventing or restricting the establishment or extension of facilities or the installation of equipment necessary for the production of goods or the rendering of services;
6. An act restricting the types or specifications of goods or services in producing or transacting goods or services;
7. An act of jointly carrying out and managing the main parts of a business, or establishing a company, etc. to jointly carry out and manage the main parts of a business; or

8. Any practice that substantially lessens competition in a particular business area by means, other than those under Subparagraph 1 to 7, of interfering with or restricting the activities or contents of business.

(2) The provision of paragraph (1) shall not apply, where unfair collaborative practices are authorized by the Fair Trade Commission as meeting the requirements specified in Presidential Decree, where they are conducted for the purposes listed in any of the following subparagraphs:

1. Industry rationalization;

2. Research and technology development;

3. Overcoming economic depression;

4. Industrial restructuring;

5. Rationalization of trade terms and conditions; or


(3) Any relevant policies with respect to the standards, methods, and procedures of authorization under paragraph (2) and modification of authorized matters shall be determined by Presidential Decree.

(4) Any contract, etc. stipulating to improper concerted acts listed in paragraph (1) shall be null and void between enterprisers.
(5) Where two or more enterprisers are committing any acts listed in the subparagraphs of paragraph (1) that practically restrict competition in a particular business area, they shall be presumed to have committed an unfair collaborative act despite the absence of an explicit agreement to engage in such act.

**Article 23. Prohibition of Unfair Business Practices**

(1) No enterpriser shall commit any act falling under any of the following subparagraphs and that is likely to impede fair trade (hereinafter referred to as "unfair business practices"), or make an affiliated company or other enterprisers perform such an act:

1. An act which unfairly refuses any transaction, or discriminates against a certain transacting partner;
2. An act designed to unfairly exclude competitors;
3. An act unfairly coercing or inducing customers of competitors to deal with oneself;
4. An act making a trade with a transacting partner by unfairly taking advantage of his position in the business area;
5. An act of trade under terms and conditions which unfairly restrict or disrupt business activities;
6. Deleted;
7. An act assisting a person with a special interest or other companies by providing advanced payment, loans, manpower, immovable assets, stocks and bonds, or
intellectual properties thereto, or by transacting under substantially favorable terms therewith; and
8. Any act that threatens to impair fair trade other than those listed in subparagraphs 1 through 7.

(2) The categories or standards for unfair business practices shall be determined by Presidential Decree.

(3) If necessary for the prevention of acts violating the provisions of paragraph (1), the Fair Trade Commission may make and announce publicly guidelines to be observed by enterprisers.

(4) In order to prevent the unreasonable inducement of customers, the enterprisers or enterprisers organization may voluntarily write a code (hereinafter referred to as the "fair competition code").

(5) Enterprisers or an enterprisers organization may request that the Fair Trade Commission examine whether or not the fair competition code as referred to in paragraph (4) violates the provisions of paragraph (1) 3 or 6.

**Article 59. Exercise of Right to Intangible Property**

The provisions of this Act shall not apply to any act which is deemed to be an exercise of rights under the Copyright Act, the Patent Act, the Utility Models Act, the Design Act, or the Trademark Act.
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