

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TIANMA MICRO-ELECTRONICS CO., LTD.,
Petitioner

v.

JAPAN DISPLAY INC. and PANASONIC LIQUID CRYSTAL DISPLAY CO.,
Patent Owners

Case No. _____
Patent No. 7,718,234

LIQUID CRYSTAL DISPLAY AND
METHOD FOR MANUFACTURING SAME

PETITION FOR *INTER PARTES* REVIEW

TABLE OF CONTENTS

I.	Introduction.....	1
II.	Statement of Precise Relief Requested	3
	A. Claims for Which Review Is Requested.....	3
	B. Statutory Grounds of Challenge	3
III.	State of the Art at the Time the Claimed Invention Was Filed	4
IV.	Prosecution History of the '234 Patent.....	11
V.	The Level of Ordinary Skill in the Art	15
VI.	Claim Construction	15
	A. “Active Devices”	16
	B. “Optical Means”	17
VII.	Claims 1-16 and 23-24 of the '234 Patent Are Unpatentable.....	18
	A. Ground 1: Tomioka in Combination with Nishikawa Render Obvious Claims 1-6, 8-12, 15-16, and 23-24 of the '234 patent.....	18
	1. Claim 1	18
	2. Claim 2	29
	3. Claim 3	29
	4. Claim 4	30
	5. Claims 5 and 6	34
	6. Claim 8	34
	7. Claim 9	35
	8. Claims 10 and 11.....	36

9.	Claim 12	37
10.	Claim 15	37
11.	Claim 16	37
12.	Claim 23	41
B.	Ground 2: Tomioka in Combination with Nishikawa and Chaudhari Renders Obvious Claim 7 of the '234 Patent	42
C.	Ground 3: Tomioka in Combination with Nishikawa and JP 10- 307295 (Suzuki) Render Obvious Claim 13 of the '234 Patent	44
D.	Ground 4: Tomioka in Combination with Nishikawa and Morii Render Obvious Claim 14 of the '234 Patent	45
E.	Ground 5: Tomioka in Combination with Nishikawa and Kim Render Obvious Claim 24 of the '234 Patent	47
F.	Claim Charts Showing Obviousness of the Challenged Claims	48
VIII.	Conclusion	59
IX.	Mandatory Notices Under 37 C.F.R. § 42.8	59
A.	Real Parties-in-Interest	59
B.	Related Matters	59
C.	Lead and Back-up Counsel, and Service Information	59
X.	Payment of Fees Under 37 C.F.R. §§42.15(a) and 42.103(a)	60
XI.	Grounds for Standing	60

LIST OF EXHIBITS

Publications marked with (+) were co-authored by Petitioner's Dr. West.

Exhibit	Description
Ex. 1001	U.S. 7,718,234 to Tomioka et al., issued May 18, 2010
Ex. 1002	U.S. file history for U.S. 7,718,234
Ex. 1003	Declaration of Dr. John L. West regarding U.S. 7,718,234
Ex. 1004	U.S. 8,758,871 to Tomioka et al., issued June 24, 2014
Ex. 1005	U.S. file history for U.S. 8,758,871
Ex. 1006	Reserved
Ex. 1007	Curriculum vitae of Dr. John L. West
Ex. 1008	U.S. 2001/0048498 to Tomioka et al., published December 6, 2001
Ex. 1009	U.S. 5,969,055 to Nishikawa et al., issued October 19, 1999
Ex. 1010	U.S. 2001/0012081 to Chaudhari et al., published August 9, 2001
Ex. 1011	JP 10-307295 to Suzuki et al., published November 17, 1998, with translation
Ex. 1012	U.S. 6,141,078 to Morii et al., issued October 31, 2000
Ex. 1013	Kim et al., Appl. Phys. Lett., Vol. 73, pp. 3372-74 (1998)
Ex. 1014	Hoogboom et al., J. of Mater. Chem., Vol. 16, pp. 1305-14 (2006)
Ex. 1015	U.S. 3,731,986 to Fergason, issued May 8, 1973
Ex. 1016	Stöhr et al., J. of Electron Spec. and Related Phenom., Vol. 98-99, pp. 189-207 (1999)
Ex. 1017	Kawamoto, Proceedings of the IEEE, Vol. 90, No. 4, pp. 460-500 (Apr. 2002)
Ex. 1018	U.S. 6,242,060 to Yoneya et al., issued June 5, 2001

Exhibit	Description
Ex. 1019	U.S. 5,731,405 to Gibbons et al., issued March 24, 1998
Ex. 1020	U.S. 2001/0046570 to Gibbons et al., published Nov. 29, 2001
Ex. 1021	U.S. 3,994,567 to Matsuo et al., issued Nov. 30, 1976
Ex. 1022	Andrienko et al., Jpn. J. Appl. Phys., Vol 39, pp. 1217-1220 (2000) ⁺
Ex. 1023	JP 2002-229039 to Yamada et al., published August 14, 2002, with translation
Ex. 1024	Kim et al., Jpn. J. Appl. Phys., Vol. 40, pp. 3381-86 (2001)
Ex. 1025	JP 09-90367 to Nishikawa et al., published April 4, 1997, with translation
Ex. 1026	Nishikawa et al., Appl. Phys. Lett., Vol. 72, pp. 2403-2405 (1998) ⁺
Ex. 1027	U.S. 6,312,769 to Hiraoka et al., issued November 6, 2001
Ex. 1028	Kim et al., Physical Review E, Vol. 57, pp. 5644-5650 (May 1998)
Ex. 1029	Park et al., Jpn. J. Appl. Phys., Vol 37, pp. 5663-5668 (1998)
Ex. 1030	Nishikawa et al., Jpn. J. Appl. Phys., Vol 38, pp. L334-L337 (1999) ⁺
Ex. 1031	Nishikawa et al., Mol. Cryst. Liq. Cryst., Vol. 325, pp. 63-78 (1998) ⁺
Ex. 1032	Rabilloud, Vol. 3, High Performance Polymers, Chp. 7 (2000)
Ex. 1033	Nishikawa et al., Mol. Cryst. Liq. Cryst., Vol. 333, pp. 165-179 (1999) ⁺
Ex. 1034	Nishikawa et al., Liquid Crystals, Vol. 26, No. 4, pp. 575-580 (1999) ⁺
Ex. 1035	Nishikawa et al., Mol. Cryst. Liq. Cryst., Vol. 329, pp. 579-587 (1999) ⁺
Ex. 1036	Nishikawa et al., SID 98 Digest, Vol. 29, pp. 131-134 (1998) ⁺
Ex. 1037	Acharya et al., Phys. Rev. E 60(6), pp. 6841-6846 (1999)

TABLE OF AUTHORITIES

	Page(s)
Federal Cases	
<i>Clearvalue, Inc. v. Pearl River Polymers, Inc.</i> , 668 F.3d 1340	35, 36
<i>DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.</i> , 464 F.3d 1356 (Fed. Cir. 2006)	26
<i>In re Fout</i> , 675 F.2d 297 (CCPA 1982)	22
<i>In re Fulton</i> , 391 F.3d 1195 (Fed. Cir. 2004)	25
<i>In re Paulsen</i> , 30 F.3d 1475 (Fed. Cir. 1994)	15
<i>In re Petering</i> , 301 F.2d 676 (CCPA 1962)	21
<i>In re Williams</i> , 36 F.2d 436 (CCPA 1929)	43
<i>Phillips v. AWH Corp.</i> , 415 F.3d 1303 (Fed. Cir. 2005)	16
<i>Titanium Metals Corp. v. Banner</i> , 778 F.2d 775 (Fed. Cir. 1985)	21, 34, 41

Federal Statutes

35 U.S.C. § 102(b)	4, 18, 43, 44, 45, 47
35 U.S.C. § 103(a)	3, 4
35 U.S.C. § 112, ¶ 6	17
35 U.S.C. § 311	1, 3
35 U.S.C. § 312	1
35 U.S.C. § 313	1
35 U.S.C. § 314	1
35 U.S.C. § 315	1
35 U.S.C. § 316	1
35 U.S.C. § 317	1
35 U.S.C. § 318	1
35 U.S.C. § 319	1

Regulations

37 C.F.R. § 42.8	59
37 C.F.R. § 42.15	60
37 C.F.R. § 42.100	1, 15
37 C.F.R. § 42.103	60

Office Patent Trial Practice Guide, 77 Fed. Reg. 48756 (Aug. 14, 2012)	15
---	----

I. Introduction

Petitioner, Tianma Micro-electronics Co., Ltd., requests *inter partes* review of claims 1-16 and 23-24 of U.S. 7,718,234 (“the ’234 patent,” Ex. 1001), assigned to Japan Display Inc. and Panasonic Liquid Crystal Display Co. (“Patent Owners”),¹ under 35 U.S.C. §§ 311-319 and 37 C.F.R. §§ 42.100 *et seq.*

The ’234 patent claims are directed to a liquid crystal display (“LCD”) and a method of producing an LCD. In particular, these LCDs require electrodes configured to apply an electric field having a component substantially in parallel with the surface of the substrate, which is admittedly a required feature of an In-Plane Switching (“IPS”) scheme. (See Ex. 1001, 1:31-50, claims 1 & 16.)

The ’234 patent’s specification states that the uniformity of the alignment-control films is a very important factor for IPS-LCDs, which allegedly cannot be addressed by various existing technologies and film materials. (See *id.*, 3:64-5:37.)

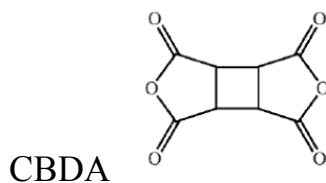
¹ The face of the ’234 patent lists Hitachi Displays, Ltd. as the assignee. The USPTO website’s assignment records, however, indicate that a 50% share was transferred to IPS Alpha Support Co., Ltd., now Panasonic Liquid Crystal Display Co. (See Reel/Frame 17329/843, 27063-19 & 27063/139.) In addition, assignment records of the grandchild patent, U.S. 8,758,871, indicate Hitachi Display Ltd. changed its name to Japan Display Inc. (See Reel/Frame 31667/225 & 31693/366.)

Specifically, the '234 patent states that while polyimide films are reliable in heat resistance, “it is difficult to ensure sufficient reliability for practical use” when polyimide is used as an alignment-control film and irradiated with polarized ultraviolet light. (*Id.*, 5:10:15.)

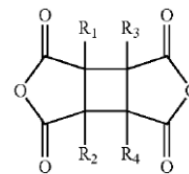
Despite its criticism of polyimide films, the '234 patent nevertheless states that it is desirable that the alignment-control film is a polyamic acid or polyimide comprising cyclobutanetetracarboxylic acid dianhydride as acid anhydride and aromatic diamine as diamine. (*Id.*, 5:56-6:64.)

As discovered by the Office, polyimide alignment-control films comprising cyclobutanetetracarboxylic acid dianhydride such as 1,2,3,4-cyclobutanetetracarboxylic acid dianhydride (CBDA) and aromatic diamines were well known, as seen in Tomioka (Ex. 1008). Indeed, Petitioner’s Dr. West published extensively on CBDA-containing alignment films before the '234 patent’s priority date. (See *e.g.*, Ex. 1022, 1026, 1030, 1031, and 1033 to 1036.)

To overcome an anticipation rejection over Tomioka, the '234 patent applicants narrowed the rejected claims to certain CBDA derivatives and alleged that Tomioka “teaches away” from these derivatives.



CBDA derivative of claim 1



Tomioka, however, does not teach away from the claimed LCDs containing the recited CBDA derivatives or the processes of making them. Instead, the '234 patent's claimed invention constitutes nothing more than the obvious substitution of one known element (CBDA) for another (CBDA derivatives), yielding results predictable to one of ordinary skill in the art. (Ex. 1003, ¶¶87-104.) Accordingly, the Board should institute trial.

II. Statement of Precise Relief Requested

A. Claims for Which Review Is Requested

Petitioner requests *inter partes* review under 35 U.S.C. § 311 of claims 1-16 and 23-24 of the '234 patent and cancellation of those claims as unpatentable.

B. Statutory Grounds of Challenge

This Petition presents the following grounds:

Grounds	
Ground 1	Claims 1-6, 8-12, 15-16, and 23 of the '234 patent are obvious under pre-AIA 35 U.S.C. § 103(a) over U.S. 2001/0048498 to Tomioka et al. ("Tomioka," Ex. 1020) in view of U.S. 5,969,055 to Nishikawa et al. ("Nishikawa," Ex. 1009).
Ground 2	Claim 7 of the '234 patent is obvious under pre-AIA 35 U.S.C. § 103(a) over Tomioka in view of Nishikawa and further in view of U.S. Patent Application No. 2001/0012081 to Chaudhari et al.

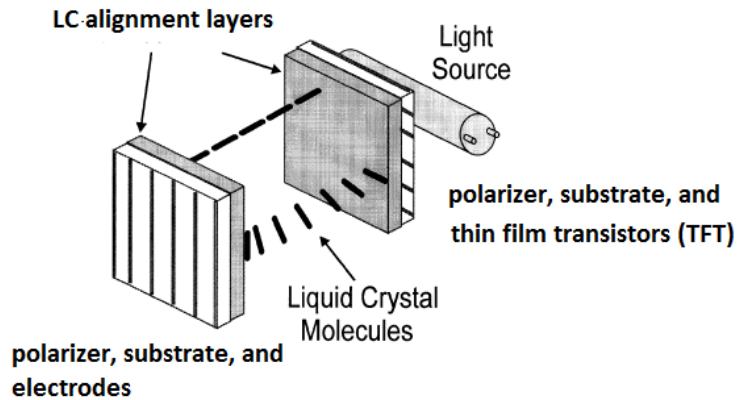
Grounds	
	(“Chaudhari,” Ex. 1010).
Ground 3	Claim 13 of the ’234 patent is obvious under pre-AIA 35 U.S.C. § 103(a) over Tomioka in view of Nishikawa and further in view of JP10-307295 to Suzuki et al.(“Suzuki,” Ex. 1011).
Ground 4	Claim 14 of the ’234 patent is obvious under pre-AIA 35 U.S.C. § 103(a) over Tomioka in view of Nishikawa and further in view of U.S. 6,141,078 to Morii et al. (“Morii,” Ex. 1012).
Ground 5	Claim 24 of the ’234 patent is obvious under pre-AIA 35 U.S.C. § 103(a) over Tomioka in view of Nishikawa and further in view of Kim et al., Appl. Phys. Lett., Vol. 73 (1998) (“Kim,” Ex. 1013).

The ’234 patent claims foreign priority to Japanese Patent Application No. 2002-356461, filed December 9, 2002. (Ex. 1001, cover (30).) Regardless of whether the ’234 patent is entitled to this foreign priority date, which Petitioner does not concede and reserves the right to challenge, Tomioka, Nishikawa, Suzuki, Morii, and Kim qualify as prior art under §102(b).

III. State of the Art at the Time the Claimed Invention Was Filed

By December 2002, one of ordinary skill in the art would have known that an LCD comprises several basic components: (i) a pair of substrates, (ii) electrodes and active devices such as thin film transistors (“TFT”) formed on the substrates,

- (iii) a liquid crystal (“LC”) layer sandwiched between the pair of substrates, and
- (iv) alignment-control layers in between the LC layer and substrates:



(Ex. 1003, ¶21.)

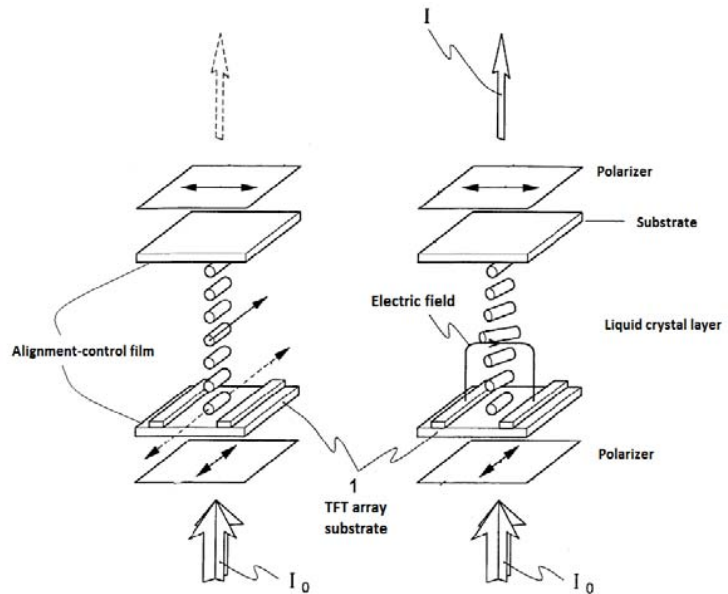
One of the most widely used cell configurations for prior art LCDs was the twisted nematic (“TN”) scheme. (*Id.*, ¶24.) In this scheme, the bottom alignment layer aligns the LC molecules in a direction parallel to the bottom polarizer’s alignment; and the top alignment layer aligns the LC molecules in a direction that is perpendicular to the alignment direction of the bottom alignment layer and bottom polarizer. This causes the LC director to twist 90° from the bottom to the top of the device. (*Id.*, ¶¶25-26.) TN technology, however, has a main drawback of providing narrow view angles. (*Id.*, ¶27.)

In 1996, the IPS scheme was developed. As seen in the Figure below, in contrast to the TN scheme, LC molecules in an IPS-LCD move parallel to the panel plane instead of perpendicular to it when an electric field is applied. (*Id.*, ¶28.) This arrangement gives IPS its characteristic of wide viewing angles and

good color reproduction.

Prior to the filing of the '234 patent, one of ordinary skill in the art would have known that an IPS-LCD is characterized by:

- (1) an electric field having a component substantially in parallel with the substrate surface to rotate LC molecules in a plane substantially in parallel with the substrate;
- (2) the top alignment layer and the bottom alignment layer of the IPS-LCD should align the LC molecules in substantially the same direction;
- (3) the smaller the pre-tilt angle of the LC molecules, which is affected by the alignment-control layer, the better the viewing angle effect, with the widest viewing angle being provided theoretically when the pre-tilt angle is 0°. (*Id.*, ¶¶28-31, Ex. 1018, 12:50-55.)



As can be seen from the discussion above, the alignment layers placed in between the LC layer and the substrates play an important role in LCDs. As such, it is not surprising that the performance of LCDs can be greatly affected by the choice of alignment-control layers and the methods used to generate the alignment-

control property. (Ex. 1003, ¶32.) Both academia and industry groups continue to look for ways to further improve or optimize the performance of the alignment-control layers.

In selecting and designing an alignment-control layer, one of ordinary skill in the art would have known to choose materials that can provide uniform alignment, small thickness, high glass transition temperature, transparency to visible light (no color), good dielectric properties, long-term thermal and optical stability, controlled uniform pre-tilt angle, etc. (*Id.*, ¶33; Ex. 1019, 2:5-10; Ex. 1008, ¶[0073]; Ex. 1010, ¶¶[0012]-[0013].)

As the material for the alignment-control film, well-known resins such as polyimides, polyamides, and polyesters had been proposed and studied. (Ex. 1009, 1:32-37.) Among those, polyimide films (and their associated polyamic acid films) were known to provide “excellent initial alignment of the liquid crystal interposed there between.” (Ex. 1020, ¶[0013]; Ex. 1021, 2:35-36.)

Their relatively easy synthesis also makes polyimide films an excellent choice for alignment-control films. Specifically, the well-known synthesis of polyimide alignment films generally includes the following steps:

- (1) preparing a polyamic acid varnish by reacting one or more types of dianhydride and diamine monomers;
- (2) coating a substrate with the polyamic acid varnish and then imidizing the

varnish with heat to form a polyimide; and

(3) imparting alignment control ability to the polyimide film.

(Ex. 1003, ¶36; Ex. 1009, cols. 13-16.)

In 1998, Kim taught a modified process in which steps (2) and (3) were conducted simultaneously. That is, during the thermal imidization step (2), the polyamic acid films were simultaneously heated and exposed to linearly-polarized light. (Ex. 1013, p.3372; *see also*, Ex. 1024.) To distinguish it from the conventional three-step process disclosed above, Kim referred to this modified process as the *in situ* UV exposure method. (Ex. 1013, p.3372.)

According to Kim, this *in situ* method “can be applied to any UV sensitive polymer to produce an alignment layer.” (*Id.*) Also, the resulting alignment layers “exhibit higher thermal stability while requiring shorter processing time than the conventional UV alignment method for PI films,” which employs UV exposure after the imidization step. (Ex. 1024, p.2381; *see also*, Ex. 1013, p.3372.)

One of the original ways to impart alignment-control ability was a rubbing treatment, such as with a roll wound with a cloth made of nylon or the like in a given direction. (Ex. 1009, 15:62-67; Ex. 1016, p.191.) Rubbing treatments, however, created problems such as contaminating particles and electrostatic charges, lowering production yields of LCDs. (Ex. 1003, ¶43; *see also*, Ex. 1026, p.2403; Ex. 1027, 1:33:50; Ex. 1028, p.5644; Ex. 1029, p.5663.) This led to the

development of non-rubbing techniques in the late 1990's. (Ex. 1003, ¶44.)

It had been recognized, well before December 2002, that the most promising non-rubbing techniques for imparting alignment control involved exposing the polyimide film to linearly-polarized ultraviolet-light. (Ex. 1003, ¶45; Ex. 1030, L334.) The Figure below shows a schematic mechanism of LC alignment by polarized UV exposure. (Ex. 1031, p.76.) Before exposure, polyimide molecular chains are randomly

aligned. Upon exposure to linearly-polarized UV-light, the chains parallel to

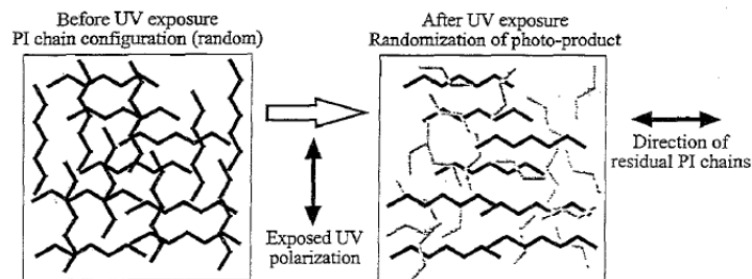


FIGURE 14 Schematic mechanism of LC alignment by a linearly polarized UV exposure; dashed lines shows the by-products of PI after polarized UV exposure.

the UV polarization are selectively modified. It is the residual polyimide chains, which were perpendicular to the UV polarization and not photo-modified, that cause the LC molecules to align along the long axis. (Ex. 1003, ¶46; Ex. 1031, pp.75-76.) Depending on the dianhydride choice, the exposed polyimide films can align LC molecules in a direction either orthogonal or parallel to the polarization axis of the polarized UV-light. (Ex. 1003, ¶51; Ex. 1034, p.576; Ex. 1036, p.131.)

As of December 2002, one of the most characterized and studied polyimide films for LC alignment were those composed of CBDA, which were imparted with alignment ability by linear-polarized light irradiation. (Ex. 1003, ¶47; Ex. 1032,

p.391.) This is seen, for example, in several articles published by Petitioner's expert, Dr. West, and Dr. Nishikawa from 1998 and 1999. (See *e.g.*, 1003, ¶¶48-56; Exs. 1026, 1033-1036.)

It is not surprising that CBDA has been widely used as the dianhydride for polyimide alignment-control films. For example, Dr. West's group prepared polyimide alignment-control films derived from various tetracarboxylic dianhydrides and reported their finding in papers published in 1998-1999. (*Id.*) For example, one paper reported that polyimide containing a cyclobutane moiety (*e.g.*, using CBDA) exhibited higher photosensitivity of LC alignment than one containing a benzene moiety (*e.g.*, using pyromellitic dianhydride). (Ex. 1033, p.168; Ex. 1003, ¶49.) Higher photosensitivity generally leads to better alignment control ability. (*Id.*, ¶49; Ex. 1033, p.173-174, Fig.9.)

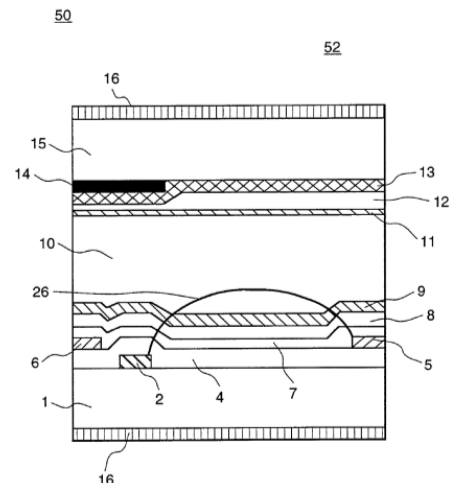
In other papers, Dr. West's group investigated a series of polyimide alignment-control films prepared from CBDA with different types of diamines (exemplified below). (Ex. 1003, ¶52; Ex. 1030, L335; Ex. 1031, p.65; Ex. 1033, p.166; Ex. 1034, p.576). Their finding showed that all diamines tested led to polyimide films with alignment-control ability via irradiation by substantially linearly-polarized light having a wavelength of 200 nm to 400 nm. For example, Dr. West's article discussed how p-phenylenediamine of Formula [2] was particularly suited for yielding polyimides with improved photosensitivity. (Ex.

1030, L335.) Similarly, JP09-90367 (Ex. 1025) reports in April 1997 the use of many claim 4 diamines, including p-phenylenediamine that forms a “good” LC alignment-control film with tetracarboxylic acid dianhydride. (*Id.*, ¶ [0024]-[0025], [0029], [0084] (synthesis example 20), ¶ [0094] (Table 1).)

Finally, papers published by Dr. West in 1998-1999 further disclose CBDA-based polyimide films providing pretilt angles ranging from 0° to 90°, depending on side chain substituent groups. (Ex. 1003, ¶55; Ex. 1035, p.580). Specifically, CBDA-based polyimide films, as described in Tomioka, had been used in IPS-LCDs due to their tendency to yield pretilt angles below 5°. (Ex. 1008, ¶[0072].)

IV. Prosecution History of the '234 Patent

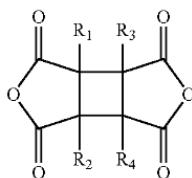
During prosecution of the application leading to the '234 patent, the Office rejected pending claims as being anticipated by Tomioka. (*See* Ex. 1002, 3/22/09 Office Action, pp. 2-5.) Tomioka's Figure 1, reproduced below, disclosed a LCD (50) comprising a pair of substrates (1,15); a LC layer (10) disposed between said pair of substrates (1,15); a group of electrodes (2,5) formed on one of said pair of substrates and configured so as to apply an electric field (26) having a component substantially in parallel (i.e., IPS) with a surface of said one of said pair of substrates (1) to said LC layer



(10); an active device (17) connected to said group of electrodes (2,5); an alignment-control film (9,11) disposed between said LC layer (10) and at least one of said pair of substrate (1,15); and optical means (16) formed on at least one of said pair of substrates (1,15) for changing the optical property of said LC layer (10) in accordance with an alignment state of LC molecules of said LC layer (10). (See Ex. 1002, 3/22/09 Office Action, p.3; Ex. 1001, Fig.1.)

Further, the Office noted that Tomioka, including Example 8, reported that the alignment-control film comprises a photoreactive polyimide and/or polyamic acid derived from CBDA and 4,4'-diamino-diphenyl methane, provided with an alignment-control ability via irradiation by substantially linearly-polarized light having a wavelength of 313 nm. (See Ex. 1002, 3/22/09 Office Action, pp.2, 4-5; Ex. 1008, ¶¶108-25, 177-81, Figs.1&2.)

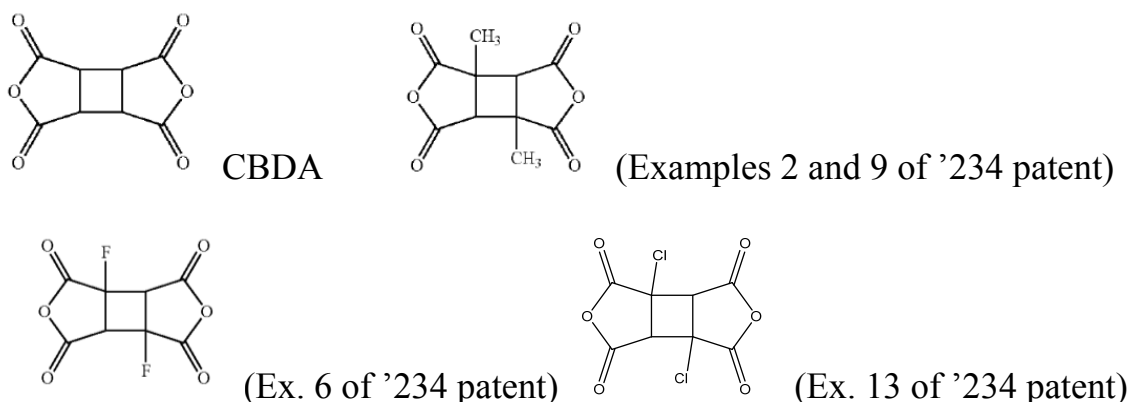
In response, applicants amended the independent claims to specify that the photoreactive alignment-control films contain polyamide acid or polyimide comprise aromatic diamine and cyclobutanetetracarboxylic acid dianhydride of formula [1]:



Applicants further added the proviso that “**at least one of R₁, R₂, R₃ and R₄**

of the compound of formula [1] is not hydrogen.” (See Ex. 1002, 9/22/09

Amendment, pp.14-15.) For support for its amendment, applicants relied on Examples 2, 6, 9, and 13 with the below CBDA derivatives as dianhydrides. (*Id.*, p.14.) As can be seen, the CBDA derivatives used in those examples differ from CBDA only by two or four substituent groups on cyclobutane moiety:



As Tomioka's Examples rely on CBDA, where each of R₁, R₂, R₃ and R₄ in formula [1] are hydrogen, applicants asserted that the amendment overcame the anticipation rejection because the “formula [1] excludes the case that all of R₁, R₂, R₃, R₄ represent a hydrogen atom.” (Ex. 1002, 9/22/09 Amendment, p.16 (emphasis original).) Applicants further argued that Tomioka taught away from the claimed invention but identified no statements from Tomioka that criticize, disclaim or otherwise discourage the use of CBDA derivatives. (*Id.*, pp.15-16.)

Not surprisingly, applicants did not allege any unexpected or superior results for the claimed invention over LCDs using a photoreactive alignment-control film derived from the claimed CBDA derivatives. Indeed, of thirteen polyimide films

disclosed in the examples of the '234 patent, ten (i.e., Examples 1, 3-5, and 7- 12) contain CBDA. And Examples 1, 4-5, 7, and 11-12 report LCD properties that equaled or exceeded those of Examples 2, 6, 9, and 13 (containing CBDA derivatives). Thus, no unexpected or superior results were obtained by using CBDA derivatives instead of CBDA. (Ex. 1003, ¶¶93-104.)

Applicants also alleged that Tomioka failed to disclose the invention of many dependent claims. (See Ex. 1002, 9/22/09 Amendment, pp.16-18.) However, the Office only agreed that Tomioka failed to teach the claimed proviso. (See *id.*, 12/28/09 Notice of Allowability, p.2.) Indeed, most of applicants' additional allegations regarding Tomioka were false. As detailed below, Tomioka expressly taught the limitations recited in application claims 2, 6, 8, 13, 15-17, and 26, which correlate with issued claims 2, 4, 6, 11, 13-15, and 24.

As discussed above and below, applicants did not invent the use of irradiation by substantially linearly-polarized light having a wavelength of 200-400nm to obtain an alignment-control ability in alignment-control films for LCDs. Likewise, they were not the first group to use linearly-polarized UV exposure with heat to obtain a more stable polyimide alignment-control film. Nor did applicants invent the claimed CBDA derivatives, which were already known dianhydrides for making polyimide alignment-control films. Rather, the invention claimed in the '234 patent was based on simple substitution of one known element (CBDA) with

another (CBDA derivatives) yielding predictable results. Consequently, these claims should never have been allowed.

V. The Level of Ordinary Skill in the Art

A person of ordinary skill at the time of the alleged invention of the '234 patent would have been someone with a Ph.D. degree in polymer chemistry/physics or polymer engineering and about 2 years of experience in LCD technology; or with a M.S. or B.S. degree in polymer chemistry/physics or polymer engineering and about 3-5 years of experience in LCD technology. (Ex. 1003, ¶¶19-20.)

VI. Claim Construction

A claim in an unexpired patent subject to *inter partes* review “shall be given its broadest reasonable construction in light of the specification of the patent in which it appears.” 37 C.F.R. §42.100(b). When applying the broadest reasonable construction, a claim term should be given its ordinary customary meaning unencumbered by unrecited limitations unless a special definition for a claim term is set forth with reasonable clarity, deliberateness, and precision. *See In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). The constructions provided below are solely for this proceeding. Claim terms not addressed below should be given their plain and ordinary meaning under the broadest reasonable interpretation standard. 37 C.F.R. §42.100(b); Office Patent Trial Practice Guide, 77 Fed. Reg. 48756, 48764

(Aug. 14, 2012). Because claims are construed under a different standard in district court, Petitioner reserves its right to present a different construction there, if applicable. *See, e.g., Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (en banc).

A. “Active Devices”

Both claims 1 and 16 recite the use of “active devices.” (Ex. 1001, 35:20-21, 38:45-46.) In both claims, the “active device” is a device connected to electrodes on a substrate configured to apply an electric field parallel to the substrate. (*Id.*) This is consistent with specification regarding the connectivity of the “active device”:

- “a substrate which has active devices such as thin film transistors formed thereon is referred to as an active matrix substrate”
- “The common electrode 103 is disposed to hide the drain electrode 106, the scanning signal wire 104, and the thin-film transistor (TFT) serving as the active device arranged in a lower layer when viewed from above, and also serves as a light shield layer for shielding the semiconductor film 116 from light.”

(*Id.*, 10:22-24, 12:46-51; *see also, id.*, 10:50-54, 12:25-29.) One can reasonably conclude, based on these characterizations, that a TFT is an example of an “active device.” Indeed, the Examiner during prosecution of the ’234 patent reached the

same conclusion. (Ex. 1002, 6/22/09 Office Action, p.3; 6/12/08 Office Action, p.3.)

B. “Optical Means”

Claims 1 and 16 include means-plus-function limitations that should be construed pursuant to pre-AIA 35 U.S.C. §112, ¶6. Claim 1 recites an “optical means ... for changing the optical property of said liquid crystal layer in accordance with an alignment state of liquid crystal molecules of said liquid crystal layer.” (Ex. 1001, 35:24-27.) Similarly, claim 16 recites an “optical means ... for changing the optical property of the liquid crystal layer in accordance with an alignment state of molecules of the liquid crystal layer.” (*Id.*, 38:60-64.) Hence, the function of the “optical means” is “changing the optical property of [the/said] liquid crystal layer in accordance with an alignment state of [liquid crystal] molecules of [the/said] liquid crystal layer.” The specification refers to only one specific device that may be used for changing optical properties: a conventional polarizing plate. (*Id.*, 11:52-55 (“At this point, the refractive index anisotropy of the liquid crystal composition layer and the effect of the polarizing plates 114 can change the light transmittance of the liquid crystal display to realize display....”).) During prosecution of the '234 patent, the Examiner reached the same conclusion; a polarizing plate is an “optical means.” (Ex. 1002, 6/22/09 Office Action, p.3.)

VII. Claims 1-16 and 23-24 of the '234 Patent Are Unpatentable

A. Ground 1: Tomioka in Combination with Nishikawa Render Obvious Claims 1-6, 8-12, 15-16, and 23-24 of the '234 patent

Because Tomioka (Ex. 1008) published on December 6, 2001, and Nishikawa (Ex. 1009) issued on October 19, 1999, both references constitute 35 U.S.C. §102(b) prior art. (Ex. 1008, cover; Ex. 1009, cover.)

1. Claim 1

In Dr. West's opinion, consistent with the Office's findings during the prosecution of the '234 patent, Tomioka discloses an LCD containing each limitation of claim 1, except the recited CBDA derivatives. That difference is nonetheless obvious.

a) "A liquid crystal display comprising"

As shown in the below claim chart and in Dr. West's opinion, Tomioka, including Example 8, discloses an IPS-LCD like claim 1. (Ex. 1003, ¶109; Ex. 1008, ¶¶[0013], [0177].)

b) "a pair of substrates, at least one of said substrates being transparent, a liquid crystal layer disposed between said pair of substrates"

As shown in the below claim chart and in Dr. West's opinion, Tomioka, including Example 8, discloses that its LCDs include "a pair of transparent substrates **1,15** ... [and] liquid crystal **10** interposed between the substrates," which are basic components of an LCD. (Ex. 1003, ¶110; Ex 1008, Abstract, Fig. 1, and

¶¶[0013], [0086], [0089], [0108], [0177] (Example 8 is based on Example 1).)

- c) **“a group of electrodes formed on one of said pair of substrates and configured so as to apply an electric field having a component substantially in parallel with a surface of said one of said pair of substrates to said liquid crystal layer”**

As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Ex. 8, discloses that its LCDs have “a common electrode 2 and pixel electrode 5 formed on the substrate 1” and this group of electrodes is configured “to apply a voltage between them to generate an electric field having a component parallel to the substrate surface as schematically shown by the reference character 26...” (Ex. 1003, ¶111; Ex. 1008, Fig. 1, ¶¶[0086], [0108], [0177].)

- d) **“a plurality of active devices connected to said group of electrodes”**

As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that its LCDs use TFTs as active devices that are connected to the group of electrodes, pixel electrode 5 and common electrode 2. (Ex. 1003, ¶112; Ex. 1008, Figs. 1&2, ¶¶[0086], [0087], [0108], [0120], [0177].) Dr. West further opined that while Example 8’s Figure 2 displayed a single active device 17 for a single pixel, the typical LCD requires one for each of its many pixels, as seen in Figure 9. (Ex. 1003, ¶113; Ex. 1008, Fig. 9.)

- e) **“an alignment control film disposed between said liquid crystal layer and at least one of said pair of substrate”**

As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that its LCDs include alignment-control films **9,11** that are disposed between LC layer **10** and substrates **1,15**. (Ex. 1003, ¶114; Ex. 1008, Fig. 1, ¶¶[0086], [0108], [0177].)

- f) **“optical means formed on at least one of said pair of substrates for changing the optical property of said liquid crystal layer in accordance with an alignment state of liquid crystal molecules of said liquid crystal layer”**

As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that its LCDs include “a polarizing plate **16** of an optical means” formed on the substrate **1**, and the polarizing plate **16** “chang[es] optical characteristic corresponding to an alignment state of the liquid crystal.” (Ex. 1003, ¶115; Ex. 1008, Fig. 1, ¶¶[0086], [0108], [0177].)

- g) **“wherein at least one of said alignment control films is an alignment control film comprising photoreactive polyimide and/or polyamic acid provided with an alignment control ability by irradiation of substantially linearly polarized light having a wavelength range from 200 nm to 400 nm”**

As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that its LCDs’ alignment-control film is a “photo-reactive material layer ... formed by irradiating nearly linearly polarized light onto

the layer” and is generally of a polyimide material. (Ex. 1003, ¶116; Ex. 1008, ¶¶[0034], [0064].) Example 8 teaches preparing an alignment-control film comprising a polyamic acid varnish with a photoalignment treatment by irradiating with linearly-polarized UV light of 313 nm wavelength. (Ex. 1003, ¶117; Ex. 1008, ¶[0177].) Thus, Tomioka discloses the claimed range of wavelengths. *See Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 (Fed. Cir. 1985) (“[W]hen, as by a recitation of ranges or otherwise, a claim covers several compositions, the claim is ‘anticipated’ if one of them is in the prior art.” (citing *In re Petering*, 301 F.2d 676, 682, (CCPA 1962).)

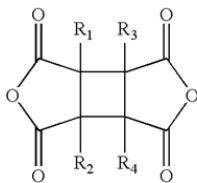
h) “wherein said photoreactive alignment control film contains polyamic acid or polyimide comprising cyclobutanetetracarboxylic acid dianhydride and/or its derivative and aromatic diamine”

As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that its LCDs’ alignment-control films are derived from CBDA and aromatic diamine. (Ex. 1003, ¶118; Ex. 1008, ¶¶[0032], [0072]-[0076].) Indeed, Example 8 discloses that its polyamic acid varnish is composed of 4,4'-diamino-diphenyl methane as the aromatic diamine and CBDA as the acid anhydride. (Ex. 1003, ¶118; Ex. 1008, ¶[0177].) These alignment-control films are photoreactive since irradiating with linearly-polarized UV light induced alignment-control abilities to the film. (Ex. 1003, ¶117.)

i) “wherein the cyclobutanetetracarboxylic acid

dianhydride and/or its derivative is a compound represented by a formula [1]:

[1]



where R₁, R₂, R₃, R₄ of the compound of formula [1] each represent a hydrogen atom, a fluorine atom, an alkyl group or alkoxy group with a carbon number of 1 to 6, with the proviso that at least one of R₁, R₂, R₃ and R₄ of the compound of formula [1] is not hydrogen”

Tomioka's LCDs differ from claim 1 only by the substitution of CBDA with CBDA derivatives such as 1,3-dimethyl-1,2,3,4-cyclobutanetetracarboxylic acid dianhydride (“1,3-dimethyl-CBDA”); an obvious difference. (Ex. 1003, ¶120.)

(1) Claim 1 Constitutes Nothing More than a Simple Substitution of One Known Element for Another to Obtain Predictable Results.

As Dr. West opined, one of ordinary skill in the art would have known that, using the conventional syntheses and alignment-control treatment, CBDA derivatives such as 1,3-dimethyl-CBDA can be combined with an aromatic diamine to form an alignment-control film. (Ex. 1003, ¶121; *see also* Ex. 1025 (JP09-90367), ¶22.) *In re Fout*, 675 F.2d 297, 301 (CCPA 1982) (“Express suggestion to substitute one equivalent for another need not be present to render such substitution obvious.”) Indeed, one of ordinary skill in the art would have recognized that CBDA derivatives such as 1,3-dimethyl-CBDA would react with the aromatic diamines via the same mechanism as CBDA for forming a control

alignment film; and when exposed to linearly polarized light, CBDA derivatives would undergo the same photochemical reaction as CBDA. (Ex. 1003, ¶88.)

For example, Nishikawa discloses that 1,3-dimethyl-CBDA is one of a handful of “particularly preferred” dianhydrides for forming alignment-control films. (Ex. 1009, 5:64-66.) Indeed, Nishikawa’s synthesis Example 8 discloses forming a polyamic acid (referred to as “polymer E-1”) comprising 1,3-dimethyl-CBDA. (Ex. 1021, 23:45-48.) Nishikawa further discloses preparing an LCD device with an alignment-control film made from a mixture containing polymer E-1 and reports “good” alignability of LC. (Ex. 1009, Tbl. 1, Ex. 9.)

While Nishikawa discloses using rubbing treatment to impart alignment-control ability to its exemplary films, such as the 1,3-dimethyl-CBDA film, Dr. West opined that one of ordinary skill in the art would not have been discouraged from using a non-rubbing treatment such as linearly-polarized light to impart 1,3-dimethyl-CBDA films with alignment-control ability. (Ex. 1003, ¶125.) In fact, Nishikawa explicitly discloses that “[b]esides the rubbing treatment, there can be used for obtaining a liquid crystal alignment film a method of applying a polarized ultraviolet light to the surface of the coated film to impart the film liquid crystal alignability....” (Ex. 1009, 19:67-20:4.) Accordingly, Nishikawa encourages this alternative technique, and one of ordinary skill in the art would have had reasonable expectation of success in using polarized ultraviolet light to impart

alignment-control ability to films of 1,3-dimethyl-CBDA. Moreover, one of ordinary skill in the art would have known that polyimides alignment-control films that have been used in TN-LCD device can also be used in an IPS-LCD. Indeed, Nishikawa states that its liquid crystal alignment films can be used in LCD devices of IPS type. (Ex. 1009, 29:10-16; Ex. 1003, ¶ 129.)

Dr. West further explained that, in practicing the teaching of Tomioka's Example 8, one of ordinary skill in the art could have substituted CBDA with 1,3-dimethyl-CBDA without facing any unique challenges or difficulty. (Ex. 1003, ¶126.) It is also his opinion that one of ordinary skill in the art would have predicted that an alignment-control film with properties similar to that of Example 8 can be formed from 1,3-dimethyl-CBDA for at least two reasons. (*Id.*, ¶126-127.)

First, Tomioka acknowledges that its "acid containing components" are not limited to the dianhydrides listed there. (Ex. 1008, ¶[0076].) Second, Nishikawa explicitly identifies both CBDA and 1,3-dimethyl-CBDA as preferred dianhydrides for achieving "good liquid crystal alignability," making no distinction between them. (Ex. 1009, 5:64-67.) As such, one of ordinary skill in the art would have considered CBDA and 1,3-dimethyl-CBDA to be interchangeable for purposes of forming alignment-control films. (Ex. 1003, ¶127.)

Dr. West further noted that the '234 patent disclosure is consistent with the conclusion that LCDs containing alignment-control films composed of CBDA

derivatives (Examples 2 and 6) exhibited “similar,” “equivalent” properties compared to LCDs containing films of CBDA (Examples 1, 4-5, 7-8, and 10-12). (See *e.g.*, Ex. 1001, 18:32:46.) Indeed, contrary to allegations made during the prosecution of the grand-parent application (Ex. 1005, 11/12/2013 Amendment, pp.17-18), these Examples and comparative Examples do not suggest any unexpected results for the claimed invention. (Ex. 1003, ¶¶89-104.)

(2) Tomioka Does Not Teach Away from the Recited CBDA Derivatives

During the prosecution of the '234 patent, applicants asserted that Tomioka “taught away from” using the CBDA derivatives recited in claim 1 for a photoreactive alignment-control film. (Ex. 1002, 9/22/2009 Amendment, p.12.) Dr. West disagrees.

Specifically, Dr. West cannot identify any teaching or suggestion in Tomioka that would have discouraged one of ordinary skill in the art from using CBDA derivatives such as 1,3-dimethyl-CBDA. (Ex. 1003, ¶87.) To the contrary, one of ordinary skill in the art would have recognized Tomioka’s explicit teaching to use “alicyclic tetracarboxylic acid anhydrides” as acid containing components, which broadly encompass both CBDA and CBDA derivatives. (Ex. 1008, ¶[0076].) While Tomioka does not list CBDA derivatives in ¶[0076], Tomioka states that “the acid containing components” are not limited to the ones listed there. (*Id.*; Ex. 1003, ¶87.) *In re Fulton*, 391 F.3d 1195, 1201, (Fed. Cir. 2004) (“the prior

art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed...."); *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1364 (Fed. Cir. 2006) ("We will not read into a reference a teaching away from a process where no such language exists.").

(3) Applicants Presented No "Unexpected Superior Results" Associated with CBDA Derivatives

While prosecuting the grand-child U.S. 8,758,871 (the "'871 patent") (Ex. 1004), applicants relied on the comparison of Examples 2 and 6 with Comparative Examples 1-3 of the '234 patent to assert that alignment-control films comprising CBDA derivatives provide "unexpectedly superior results" over films that do not contain CBDA derivatives. (Ex. 1005, 11/12/13 Amendment, pp.17-18.) Dr. West disagrees that there are any unexpected results and further notes that applicants' comparison was misleading for at least the following reasons. (Ex. 1003, ¶¶92.)

First, the comparative examples changed more than one variable as compared to each other and against Examples 2 and 6. As such, one of ordinary skill in the art would not have been able to reach any meaningful scientific conclusion by making applicant's comparison of examples. (Ex. 1003, ¶¶93-95.)

Second, applicants failed to explain to the Examiner that, in addition to Comparative Examples 1-3, there are **eight** more examples (i.e., Examples 1, 4-5,

7-8, and 10-12) in the '234 patent that do not include alignment-control films within the scope of claim 1. (Ex. 1001, 15:5-17:50, 22:14-25:4, 26:8-28:6, 29:55-33-30.) Specifically, these eight Examples contain CBDA, which, according to applicants, was “excluded” from claim 1 because each of R₁, R₂, R₃, R₄ represent a hydrogen atom. (See Ex. 1002, 9/22/09 Amendment, p.16; Ex. 1003, ¶96.)

However, one of ordinary skill in the art would have recognized that Examples 2 and 6 provide *equivalent*, rather than superior, results as compared to the eight Examples, all of which fall *outside* the scope of claim 1 of the '234 patent. In fact, the '234 patent specifically describes the properties of Examples 2 and 6 (containing CBDA derivatives) as “equivalent” or “similar” to Examples 1 and 5 (containing CBDA), respectively. (Ex. 1001, 18:33-46, 25:51-67; Ex. 1003, ¶97.) Thus, the '234 patent admits there were no “unexpected superior results” obtained by using CBDA derivatives in place of CBDA.

Third, according to Dr. West, one of ordinary skill in the art would not have found it surprising or unexpected that comparative Examples 1 and 3 that use pyromellitic acid dianhydride as dianhydride exhibited inferior properties as compared to Example 1 (containing CBDA) or Example 2 (containing CBDA derivative). Specifically, one of ordinary skill in the art would have known, prior to the filing of the '234 patent, that films of CBDA with a cyclobutane moiety exhibited better photosensitivity of LC alignment than films of dianhydrides with a

benzene moiety. (Ex. 1033, p.173-74, Fig. 9.) As such, CBDA-derivative used in Example 2 would be predicted to have better alignment-control properties as compared to Comparative Examples 1 and 3. (Ex. 1003, ¶¶98-100.)

Fourth, as Dr. West further opined, applicants failed to explain to the Examiner that it was a different alignment process, rather than different dianhydrides, that caused Comparative Example 2 to exhibit properties inferior to the other examples. (Ex. 1003, ¶¶101-103.) For instance, Example 1 and Comparative Example 2 contain the same dianhydride and diamine. In Example 1, the heating step that induces imidization was performed to overlap in time with the step of irradiation with polarized light. (Ex. 1001, 16:17-21.) In Comparative Example 2, however, when the film was exposed to the polarized light, no heat was applied. (*Id.*, 21:2-4.)

Dr. West further opined, based on teachings of Kim, that one of ordinary skill in the art would have known that a process containing a step of exposing the polyamic acid film to polarized light during the heating (imidization) step leads to better alignment-control films than a process applying heat and polarized light separately. (Ex. 1013 (Kim 1998), p.3374; Ex. 1024 (Kim 2001), p.2386; Ex. 1003, ¶103.)

Hence, one of ordinary skill in the art would not have found that Examples 2 and 6 provide “unexpected results” as applicants alleged. Accordingly, claim 1 is

unpatentable over Tomioka in view of Nishikawa.

2. Claim 2

“an alignment direction of the liquid crystal molecules ...
is in parallel with or orthogonal to a polarization axis of
the substantially linearly polarized light for irradiation”

Claim 2 further limits claim 1. As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that after irradiation, the alignment direction of the LC molecules are in parallel with or orthogonal to the polarization axis of the polarized light. Indeed, Example 8’s LCD has “a good liquid crystal alignment in the vertical [i.e., orthogonal] direction to the direction of the irradiation linearly polarized light was obtained.” (Ex. 1008, ¶[0178]; Ex. 1003, ¶133.)

3. Claim 3

“said photoreactive alignment control film is polyamic acid or polyimide containing at least 50% of a repeated structure of polyamic acid or polyimide comprising said cyclobutanetetra-carboxylic acid dianhydride and/or its derivative and said aromatic diamine”

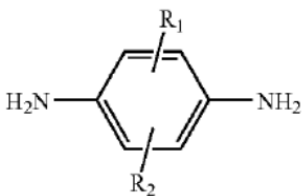
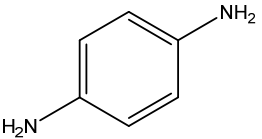
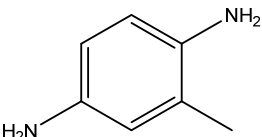
Claim 3 further limits claim 2. As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that the polyamic acid or polyimide of the alignment-control film contain at least 50% of the claimed repeating structure. Namely, Example 8’s polyamic varnish is derived from 4,4’-

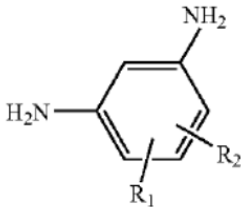
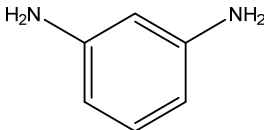
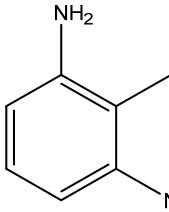
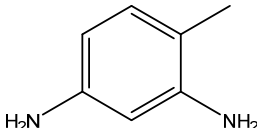
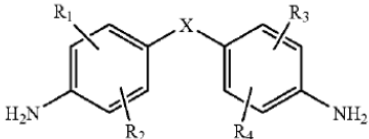
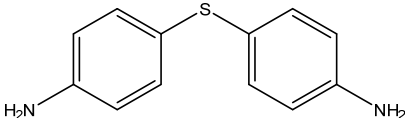
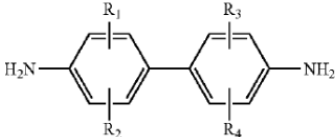
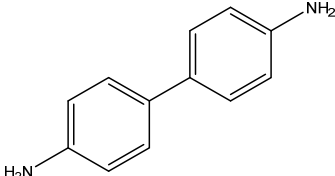
diamino-diphenyl methane as the sole aromatic diamine and CBDA as the sole acid anhydride. (Ex. 1008, ¶[0177].) Hence, this polyamic acid contains 100% (i.e., at least 50%) of “a repeated structure of polyamic acid or polyimide comprising said cyclobutanetetracarboxylic acid dianhydride and/or its derivative and said aromatic diamine.” (Ex. 1003, ¶135.)

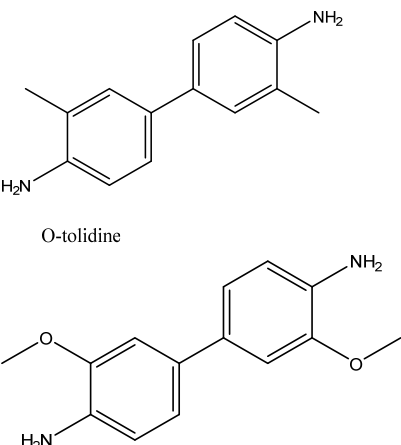
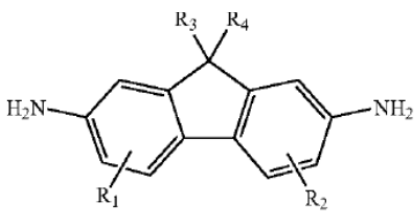
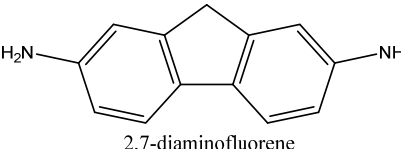
4. Claim 4

“the aromatic diamine compound contains at least one of compounds selected from a group of compounds consisting of ones represented by formulas [2] to [16]”

Claim 4 further limits claim 3. As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that the use of aromatic diamines, such as those recited in claim 4. For example, Tomioka specifies 22 diamines that can be used to make its alignment-control layer. (See Ex. 1008, ¶[0074].) Of these, about half (i.e., 10) are of Formulae [2], [3], [5], [6], and [16]:

Claim 4	¶[0074] of Tomioka
Formula [2]  where R_1, R_2, R_3, R_4 of the compounds represented by formulas [2] to [16] each represent a hydrogen atom, a fluorine atom, an alkyl group or alkoxy group with a carbon number of 1 to 6, or a vinyl group $\{-(CH_2)_m-CH=CH_2, m=0, 1, 2\}$ or an acetyl group $\{-(CH_2)-C\equiv CH, n=0, 1,$	 p-phenylene diamine ,  2,5-diaminotoluene

Claim 4	¶[0074] of Tomioka
2} Formula [3]  where R₁, R₂, R₃, R₄ of the compounds represented by formulas [2] to [16] each represent a hydrogen atom, a fluorine atom, an alkyl group or alkoxy group with a carbon number of 1 to 6, or a vinyl group {—(CH₂)_m—CH=CH₂, m=0, 1, 2} or an acetyl group {—(CH₂)—C≡CH, n=0, 1, 2}	 m-phenylene diamine  2,6-diaminotoluene  2,4-diaminotoluene
Formula [5]  where R₁, R₂, R₃, R₄ of the compounds represented by formulas [2] to [16] each represent a hydrogen atom, a fluorine atom, an alkyl group or alkoxy group with a carbon number of 1 to 6, or a vinyl group {—(CH₂)_m—CH=CH₂, m=0, 1, 2} or an acetyl group {—(CH₂)—C≡CH, n=0, 1, 2}, and in the formula [5], X represents a bond group —S—, —CO—, —NH—	 4,4'-diaminodiphenyl sulfide
Formula [6]  where R₁, R₂, R₃, R₄ of the compounds represented by formulas [2] to [16] each represent a hydrogen atom, a fluorine atom, an alkyl group	 benzidine

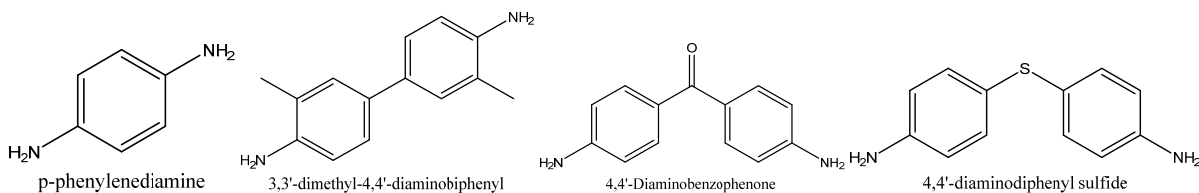
Claim 4	¶[0074] of Tomioka
or alkoxyl group with a carbon number of 1 to 6, or a vinyl group $\{-(CH_2)_m-CH=CH_2, m=0, 1, 2\}$ or an acetyl group $\{-(CH_2)-C\equiv CH, n=0, 1, 2\}$,	 O-tolidine 3,3'-dimethoxy benzidine
Formula [16]  where R_1, R_2, R_3, R_4 of the compounds represented by formulas [2] to [16] each represent a hydrogen atom, a fluorine atom, an alkyl group or alkoxyl group with a carbon number of 1 to 6, or a vinyl group $\{-(CH_2)_m-CH=CH_2, m=0, 1, 2\}$ or an acetyl group $\{-(CH_2)-C\equiv CH, n=0, 1, 2\}$	 2,7-diaminofluorene

(*Id.*; Ex. 1003, ¶136.)

Further, Nishikawa suggests that many of Tomioka's overlapping list are preferred aromatic diamines for polyamic acid and polyimide alignment-control films. (Ex. 1009, 11:13-16 (p-phenylenediamine, 4,4'-diaminodiphenyl sulfide, 1,5-diamino-naphthalene, 2,7-diaminofluorene, and 4,4'-diaminodiphenyl ether).)

In view of Tomioka's listing of these preferred aromatic diamines, Dr. West opined that, in practicing Tomioka Example 8, one of ordinary skill in the art would have considered these aromatic diamines to be interchangeable for the purpose of forming an alignment-control film, and obvious to substitute Example 8's aromatic diamine with any of the listed diamines. (Ex. 1003, ¶137.) Moreover, according to Dr. West, one of ordinary skill in the art would not have faced any unique challenges or difficulty in obtaining a film with predictable alignment-control functionality. (*Id.*) It is also his opinion that one of ordinary skill in the art would have predicted that an alignment-control film with properties similar to that of Example 8 can be formed from those diamines. (*Id.*)

In fact, as noted earlier, several of those diamines, shown immediately below, have been repeatedly and successfully used as aromatic diamines for forming alignment-control films with non-rubbing treatment in various studies published years before the filing of the '234 patent.



(See *e.g.*, Ex. 1032, p.386; Ex. 1034, p.576; Ex.1025, ¶ [0024]-[0025], [0029])

Indeed, Dr. West's article with Dr. Nishikawa discussed how p-phenylenediamine of Formula [2] was particularly suited for yielding polyimides with improved

photosensitivity. (Ex. 1030, L335; Ex. 1003, ¶¶ 137-9.)

5. Claims 5 and 6

5: “said alignment control film ... has a thickness from 1 nm to 100 nm”

6: “wherein said alignment control film has a thickness from 1 nm to 50 nm above the electrodes constituting said group of electrodes”

Claims 5 and 6 further limit claim 1. As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that its alignment-control films, i.e., including the one above the electrodes, have a thickness of 1 nm to 100 nm, such as 1 nm to 50 nm. In particular, Example 8 reports that its alignment layer had a thickness of about 50 nm (i.e., “from 1 nm to 100 nm,” such as “from 1 nm to 50 nm”). (Ex. 1008, ¶[0177]; *see also, id.*, ¶¶[0114], [0116]; Ex. 1003, ¶143.) *See Titanium Metals*, 778 F.2d at 227.

6. Claim 8

“the alignment control film has a glass transition temperature equal to or higher than 250 °C”

Claim 8 further limits claim 1. As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses alignment control films having a T_g equal to or higher than 250 °C. (Ex. 1003, ¶145.) In particular, Tomioka discloses that the alignment film preferably has a T_g that is “higher than 220 °C” (an unbounded range that includes equal to or higher than 250 °C),

because “having a Tg exceeding 220 °C can reduce the after image to a degree which can satisfy an allowable value of display performance.” (Ex. 1008, ¶[0073].)

Hence, Dr. West opined that that, in practicing Example 8, one of ordinary skill in the art would have been motivated to modify the composition of the alignment-control film, if necessary, to have a Tg higher than 220 °C, such as higher than 250 °C to obtain these benefits. (*Id.*, ¶146.) *Clearvalue, Inc. v. Pearl River Polymers, Inc.*, 668 F.3d 1340, 1354 (Fed. Cir. 2012) (reversing denial of JMOL, where absent evidence of criticality, prior art disclosure of 150 ppm or less anticipates claim to 50 ppm or less). Dr. West further opined that a person of ordinary skill in the art has the necessary know-how to make such modification. Indeed, alignment-control films with Tg equal to or higher than 250 °C are not uncommon. (*See e.g.*, Ex. 1023 (JP2002-229039), ¶[0033] (286 °C).)

7. Claim 9

“said liquid crystal layer has a pretilt angle equal to or smaller than one degree”

Claim 9 further limits claim 1. As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that its LCDs have a LC layer with a pretilt angle equal to or smaller than one degree. Specifically, Tomioka teaches that the pretilt angle is “very small in the photo-reactive alignment layer,” which is expected to provide better viewing characteristic for IPS-LCDs.” (Ex. 1008, ¶[0081], [0072].) Indeed, Example 8 reports a pretilt angle

of “about 1 degree,” which satisfies claim 9’s “equal to or smaller than one degree” limitation. (*Id.*, ¶[0179]; Ex. 1003, ¶149.) See *Clearvalue*, 668 F.3d at 1354.

8. Claims 10 and 11

10: “...at least one of the pixel electrode and the common electrode is formed of a transparent electrode”

11: “the transparent electrode is formed of an ion-doped titanium oxide film or an ion-doped zinc oxide film”

Claim 10 further limits claim 1 and claim 11 further limits claim 10. As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that its LCDs may have pixel and common electrode, where at least one is a “transparent electric conductive film [such as] an ion-doped titanium oxide film or an ion-doped zinc oxide film.” (Ex. 1008, ¶[0036].)

Indeed, while chromium films are used for the common electrode and the pixel electrode of Examples 1 and 8, Tomioka explains that “a higher brightness characteristic may be attained by using ITO films to form transparent electrodes.” (*Id.*, ¶¶[0112], [0177].) In view of the recommendation, Dr. West opined that, in practicing the teaching of Tomioka Example 8, one of ordinary skill in the art would have found it obvious to make such a simple substitution of transparent ITO films for the chromium films used in both common electrode 2 and the pixel electrode 5 with a reasonable expectation to obtain a higher brightness characteristic. (Ex. 1003, ¶¶151-2.)

9. Claim 12

“the common electrode or a wire for the common electrode or a wire for a signal is made of Al, Cr, Mo, Ta, W or an alloy containing any one of them”

Claim 12 further limits claim 10. As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Ex. 8, discloses LCDs having a common electrode made from one or more of the claimed elements and alloys, such as Al. In particular, Example 1 and 8 reports that “common electrode **2** and the scanning electrode **18** are aluminum films....” (Ex. 1008, ¶¶[0111], [0177]; Ex. 1003, ¶154.)

10. Claim 15

“said liquid crystal molecules have substantially the same alignment control directions at two interfaces between said liquid crystal layer and said alignment control film.”

Claim 15 further limits claim 1. As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses in Tomioka’s LCD, “the alignment control directions of the liquid crystal in the two interfaces between the liquid crystal layer and the pair of substrates are nearly equal to each other.” (Ex. 1008, ¶[0037]; Ex. 1003, ¶156.)

11. Claim 16

As a method of producing an LCD, the analysis of claim 16 largely follows the analysis provided for the LCDs of claim 1.

a) “A method of producing a liquid crystal display, comprising the steps of”

As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses making IPS-LCDs like claim 16. (Ex. 1003, ¶158; Ex. 1008, ¶¶[0013], [0177].)

b) “forming a group of electrodes on one substrate and configuring the group of electrode so as to apply an electric field having a component substantially in parallel with a surface of the one substrate”

As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Ex. 8, discloses that its LCDs have “a common electrode 2 and pixel electrode 5 formed on the substrate 1” and this group of electrodes are configured “to apply a voltage between them to generate an electric field having a component parallel to the substrate surface as schematically shown by the reference character 26....” (Ex. 1003, ¶159; Ex. 1008, Fig. 1, ¶¶[0086], [0108], [0177].)

c) “forming a plurality of active devices on the one substrate which are connected to the group of electrodes”

As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses making its LCDs with TFTs as active devices on the substrate connected to the group of electrodes, pixel electrode 5 and common electrode 2. (Ex. 1008, Figs. 1& 2, ¶¶[0086], [0087], [0180], [0120], [0177].)

While Example 8’s Figure 2 displays a single active device 17 for a single pixel, the typical LCD requires one for each of its many pixels, as seen in Figure 9. (*Id.*,

Fig. 9; Ex. 1003, ¶¶161-2.)

- d) **“sandwiching a liquid crystal layer between a pair of substrates ... so as to enable the group of electrodes to apply the electric field having the component substantially in parallel to the surface of the one substrate ..., at least one of the substrates being transparent”**

As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Ex. 8, discloses that its LCDs include “a pair of transparent substrates **1,15** ... [and] liquid crystal **10** interposed between the substrates.” (Ex. 1003, ¶163; Ex 1008, Abstract, Fig. 1, and ¶¶[0013], [0086], [0089], [0108], [0177].)

- e) **“disposing an alignment control film between the liquid crystal layer and at least one of the pair of substrates”**

As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that its LCDs include alignment-control films **9,11** disposed between LC layer **10** and substrates **1,15**. (Ex. 1003, ¶164; Ex. 1008, Fig.1, ¶¶[0086], [0108], [0177].)

- f) **“the alignment control film comprising photoreactive polyimide and/or polyamic acid provided with an alignment control ability by irradiation of substantially linearly polarized light”**

As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that its LCDs’ alignment-control film is a “photo-reactive material layer ... formed by irradiating nearly linearly polarized light onto the layer” and is generally of a polyimide material. (Ex. 1008, ¶¶[0034], [0064].)

Indeed, Example 8 teaches preparing an alignment-control film from a polyamic acid varnish. (*Id.*, ¶[0177].) The Example explicitly teaches that this film is photoreaction as the “alignment control ability” was provided by irradiating linearly-polarized UV light. (*Id.*; Ex. 1003, ¶¶165-6.)

- g) “the liquid crystal display having optical means formed on at least one of the pair of substrates for changing the optical property of the liquid crystal layer in accordance with an alignment state of molecules of the liquid crystal layer”**

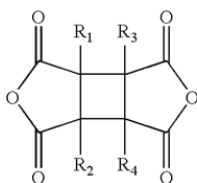
As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that its LCDs include “a polarizing plate **16** of an optical means” formed on the substrate **1**, and the polarizing plate **16** “chang[es] optical characteristic corresponding to an alignment state of the liquid crystal.” (Ex. 1003, ¶167; Ex. 1008, Fig.1, ¶¶[0086], [0108], [0177].)

- h) “wherein the polarized light for irradiation of the liquid crystal alignment control film has a wavelength range from 200 nm to 400 nm wherein said photoreactive alignment control film contains polyamic acid or polyimide comprising cyclobutanetetracarboxylic acid dianhydride and/or its derivative and aromatic diamine”**

As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses that its LCDs’ alignment-control films of CBDA and aromatic diamine, aligned with polarized light having a wavelength of 200-400nm. (Ex. 1008, ¶¶[0032], [0034], [0072]-[0076].) Indeed, Example 8’s

polyamic-acid varnish comprises 4,4'-diamino-diphenyl methane as the aromatic diamine and CBDA as the acid anhydride; and its linearly-polarized UV light was 313 nm. (*Id.*, ¶[0177]; Ex. 1003, ¶¶168-9.) *Titanium Metals*, 778 F.2d at 227.

- i) **“wherein the cyclobutanetetracarboxylic acid dianhydride and/or its derivative is a compound represented by a formula [1]:**



[1]

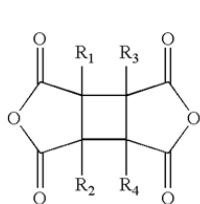
where R₁, R₂, R₃, R₄ of the compound of formula [1] each represent a hydrogen atom, a fluorine atom, an alkyl group or alkoxy group with a carbon number of 1 to 6, with the proviso that at least one of R₁, R₂, R₃ and R₄ of the compound of formula [1] is not hydrogen”

Tomioka’s method differs from claim 16 only by the substitution of CBDA with CBDA derivatives such as 1,3-dimethyl-CBDA. (Ex. 1003, ¶172.) As detailed above with respect to claim 1, and incorporated by reference here, claim 16 is obvious because (i) it constitutes nothing more than simple substitution of one known element for another with predictable results; (ii) Tomioka does not teach away from the use of the recited CBDA derivatives; and (iii) applicants presented no “unexpected superior” results associated with the use of CBDA derivatives. (*Id.*, ¶¶173-180.) Hence, the claim is unpatentable over Tomioka and Nishikawa.

12. Claim 23

“the cyclobutanetetracarboxylic acid dianhydride and/or its

derivative is a compound represented by a formula [1]:



wherein R₁, R₂ of the compound of formula [1] each represent a fluorine atom, an alkyl group or alkoxyl group with a carbon number of 1 to 6”

As shown in the below claim chart and in Dr. West’s opinion, it would have been obvious to a person of ordinary skill in the art to select and substitute a 1,2-substituted CBDA, such as 1,2-dimethyl-1,2,3,4-cyclobutane-tetracarboxylic acid dianhydride (“1,2-dimethyl-CBDA”). As detailed above with respect to claim 1, and incorporated by reference here, it would have been obvious to a person of ordinary skill in the art to substitute a CBDA derivative for CBDA, as used in Tomioka Example 8 in view Nishikawa.

For example, like 1,3-dimethyl-CBDA discussed in claim 1, Nishikawa discloses 1,2-dimethyl-CBDA as an alternative for CBDA in formation of alignment-control films; i.e., a simple substitution. (Ex. 1009, 2:30-37.) Thus, one of ordinary skill in the art would have had reasonable expectation of success in preparing an alignment-control films from 1,2-dimethyl-CBDA. (Ex. 1003, ¶183.)

B. Ground 2: Tomioka in Combination with Nishikawa and Chaudhari Renders Obvious Claim 7 of the ’234 Patent

Claim 7 further limits claim 1 by requiring “said alignment control film

[have] a thickness from 1 nm to 30 nm above the ... group of electrodes.” As discussed with respect to claims 5-6, Tomioka Example 8 had a thickness of 50nm. However, as shown in the below claim chart and in Dr. West’s opinion, one of ordinary skill in the art would have found it obvious to modify the Tomioka film to 1-30nm, as it was a design choice and there were no technological limitations preventing the formation of such a film. (Ex. 1003, ¶184.) *In re Williams*, 36 F.2d 436, 438 (CCPA 1929) (“It is a settled principle of law that a mere carrying forward of an original patented conception involving only change of form, proportions, or degree, or the substitution of equivalents doing the same thing as the original invention, by substantially the same means, is not such an invention as will sustain a patent, even though the changes of the kind may produce better results than prior inventions.”)

For example, while LC molecules’ orientation should change instantaneously with the switching of the applied voltage, residual charges may accumulate within the polyimide alignment layer, causing a delay called “image sticking.” (Ex. 1010, ¶[0011]). To alleviate this problem, Chaudhari (Ex. 1010), which was published on August 9, 2001, and is §102(b) prior art, teaches using thin polyimide alignment films, such as 10 nm, that allow for charge hopping or tunneling, thereby minimizing or eliminating the residual charge, leading to “a very high quality display.” (*Id.*, ¶¶[0012]-[0013].) Chaudhari further discloses that

such thin film can be formed by diluting polyimide with a solvent at 1:10 ratio, and then the polyimide solution spun or sprayed onto substrates, like Tomioka's process. (*Id.*, ¶[0025]; Ex. 1008, ¶[0114].) According to Dr. West, one of ordinary skill in the art would have had no technological hurdles to modify Tomioka's device with Chaudhari's disclosure. (Ex. 1003, ¶187.)

Based on Chaudhari's teachings, one of ordinary skill in the art would have been motivated to lower the thickness of the film from 50nm to, for example, 10nm, with a reasonable expectation of success. (*Id.*, ¶¶185-187.)

C. Ground 3: Tomioka in Combination with Nishikawa and JP 10-307295 (Suzuki) Render Obvious Claim 13 of the '234 Patent

Claim 13 further limits claim 10 by requiring that "the pixel electrode and the common electrode ... are disposed in parallel ... and each have a bending structure." As shown in the below claim chart and in Dr. West's opinion, Tomioka, including Example 8, discloses that pixel electrode 5 and common electrode 2 are disposed in parallel with each other and each of the electrodes has a U-shape bending structure. (Ex. 1008, Fig.2; Ex. 1003, ¶188.)

Suzuki (Ex. 1011), published on November 17, 1998, and is §102(b) prior art, discloses an IPS-LCD in which common electrode and source (pixel) electrode are disposed in parallel with each other in a V-shape bending structure, which helps suppress variation in tint of the displayed images due to changes in the angle of view. (*Id.*, ¶[0073]-[0075], [0080], Fig.4.) Note, the '234 patent correlates

“source electrode” with “pixel electrode.” (Ex. 1001, 12:31.)

Based on Suzuki’s disclosure, Dr. West concluded that Suzuki’s configuration is a simple design choice such that a person of ordinary skill in the art would have been motivated to modify Tomioka’s Example 8 with Suzuki’s electrode configuration for the reasons explained above with a reasonable expectation of improving viewing angle. (Ex. 1003, ¶¶189-190.)

D. Ground 4: Tomioka in Combination with Nishikawa and Morii Render Obvious Claim 14 of the ’234 Patent

Claim 14 further limits claim 10 by requiring forming the common and/or the pixel electrode on an organic insulating film, and forming the LC alignment film on this film and the pixel and common electrodes. As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses an insulating layer that may be organic. (Ex. 1008, ¶¶[0026]-[0027].)

Like Tomioka, Morii (Ex. 1012), which qualifies as §102(b) prior art with a publication date of October 31, 2000, is directed to an IPS-LCD. (*Id.*, title.) As shown in Fig. 6, Morii discloses forming pixel electrodes **2** on an organic insulating film **16** with a polyimide alignment-control film **23** formed on the electrodes **2** and the insulating film **16**. (*Id.*, ¶¶9:40-42, 10:7-9, 50-51, & 58-59; 11:15-24.)

Morii discloses that “[t]he flatting film 16 is of an organic film of, for instance, photosensitive acrylic resin or of acrylic resin.” (*Id.*, 9:40-42.) The ’234

patent similarly discloses that its insulating organic film is of an acrylic resin. (Ex. 1001, 15:34-36.)

Morii further discloses an IPS-LCD in which pixels electrodes 2 were formed in lower portions of the flatting film 16, like Tomioka. (Ex. 1012, Fig. 2; 11:39-40; Ex. 1008, Fig. 2, ¶ [0113] (elements 5 and 8.)) According to Morii, however, when pixel electrodes were formed in lower portions of the organic film, “losses in effective voltage applied to the liquid crystal were generated,” which leads to large electricity consumption. (Ex. 1012, 11:38-44.) Hence, Morii advises to dispose pixel electrodes 2 on the organic film 16 and closer to the liquid crystal layer 7 such that more voltage can be applied to the liquid crystal than the other configuration. (*Id.*, 11: 45-52.) “With this arrangement, irregularities in color which occurred on conventional IPS panels could be eliminated and an IPS panel of high display quality as a display could be manufactured.” (*Id.*, 11:53-56.)

Based on Morii’s disclosure, Dr. West concluded that, to further improve the display characteristics of Tomioka’s LCD, one of ordinary skill in the art would have been motivated to (i) form the common electrode and/or pixel electrode on an organic film and (ii) form the alignment-control film on the organic film and on the electrodes as shown in Morii Fig. 6. (Ex. 1003, ¶197.) One of ordinary skill in the art would have recognized that alignment-control films prepared based on the combination of Tomioka and Nishikawa can be easily combined with Morii’s

arrangement of the organic film and electrodes as shown in Fig. 6. (*Id.*, ¶198.)

Indeed, Morii teaches that “polyimide is favorably used as a material” for alignment-control films. (Ex. 1012, 10:12:15.) Thus, one of ordinary skill in the art would have had a reasonable expectation of success in modifying Tomioka’s LCDs with Morii’s organic insulating organic film and electrodes. (*Id.*)

**E. Ground 5: Tomioka in Combination with Nishikawa and Kim
Render Obvious Claim 24 of the ’234 Patent**

Claim 24 further limits claim 1 by requiring that “the alignment control ability ... is promoted and stabilized by heating ... said alignment control film.” As shown in the below claim chart and in Dr. West’s opinion, Tomioka, including Example 8, discloses irradiating with linearly-polarized UV light at 313 nm without heating imparts alignment-control ability to the film. (Ex. 1008, ¶[0177].)

As discussed above, Kim (Ex. 1013), published on December 7, 1998, and is §102(b) prior art, discloses an *in situ* method for LC alignment using linear-polarized UV exposure in combination with heat, i.e., during imidization. (*Id.*, p.3372.) According to Kim, the *in situ* method provided “better thermal stability and requires less processing time.” (*Id.*, p.3374.) Moreover, this *in situ* method “can be applied to any UV sensitive polymer to produce an alignment layer.” (*Id.*, p.3372.)

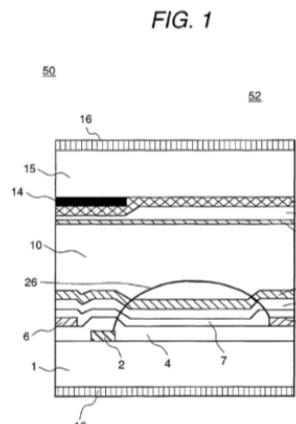
Kim was publicly accessible as of December 1998 at least as evident by the Library of Congress Copyright Office stamp shown at page 2 of 8 of Ex. 1013.

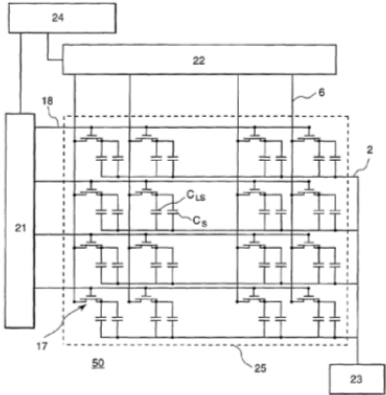
(Ex. 1003, ¶204.) Indeed, it was cited in 1999 in Ex. 1037. (*Id.*) Further, Kim was accessible on the publisher’s web page, aip.org. (Ex. 1013 at 1 of 8).

Based on Kim’s disclosure, Dr. West concluded that one of ordinary skill in the art would have been motivated to modify Example 8’s process with Kim’s *in situ* method with a reasonable expectation of improving the properties of the alignment-control film. (Ex. 1003, ¶¶202-3.)

F. Claim Charts Showing Obviousness of the Challenged Claims

For the Board’s convenience, Petitioner provides the following claim charts showing exemplary citations from the cited prior art for the claim elements.

The '234 patent	<i>Tomioka, Nishikawa, Suzuki, Morii, and Kim</i>
1. A liquid crystal display comprising a pair of substrates, at least one of said substrates being transparent; a liquid crystal layer disposed between said pair of substrates;	Tomioka discloses: “[a]s shown in FIG. 1 and FIG. 2, the first embodiment of the liquid crystal display device 50 is composed of a pair of transparent glass substrates 1, 15; liquid crystal 10 interposed between the substrates 1, 15.” Ex. 1001, ¶89; see also, ¶¶13, 108 (Ex 1 “will be described below, referring to FIG. 1 and FIG. 2”), 109, 116, 119 & Abstract. As to Ex 8, “[e]xcept the alignment layer used, a liquid crystal display device was formed using the same materials and the same processes as the embodied example 1.” <i>Id.</i>, ¶177. 
a group of electrodes formed on one of said pair of substrates and configured so as to apply an electric field	Tomioka discloses: “[a]s shown in FIG. 1 ... a common electrode 2 and pixel electrode 5 formed on the substrate 1 so as to apply a voltage between them to generate an electric

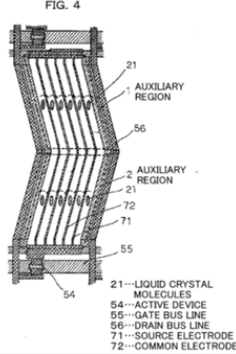
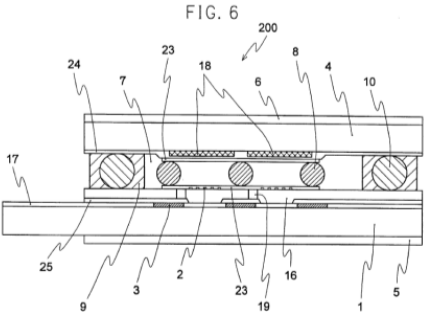
The '234 patent	<i>Tomioka, Nishikawa, Suzuki, Morii, and Kim</i>
having a component substantially in parallel with a surface of said one of said pair of substrates to said liquid crystal layer;	field having a component parallel to the substrate surface as schematically shown by the reference character 26 in the figure” <i>Id.</i>, ¶86 (emphasis added); <i>see also</i>, ¶108 (Ex 1 “will be described below, referring to FIG. 1 and FIG. 2”). As to Ex 8, “[e]xcept the alignment layer used, a liquid crystal display device was formed using the same materials and the same processes as the embodied example 1.” <i>Id.</i>, ¶177.
a plurality of active devices connected to said group of electrodes;	Tomioka discloses: “[a]s shown in FIG. 1 and FIG. 2, ... an active element of a thin film transistor (TFT) 17 formed in the substrate 1” <i>Id.</i>, ¶86. “In the first embodiment of the liquid crystal display device 50, an electric field 26 is generated between the common electrode 2 and the pixel electrode 5 by an action of the thin film transistor 17 to induce switching-motion of the liquid crystal molecules” <i>Id.</i>, ¶87; <i>see also</i>, ¶¶108 (Ex 1 “will be described below, referring to FIG. 1 and FIG. 2”), 109. As to Ex 8, “[e]xcept the alignment layer used, a liquid crystal display device was formed using the same materials and the same processes as the embodied example 1.” <i>Id.</i>, ¶177. FIG. 9 shows a plurality of thin film transistor 17. 
an alignment control film disposed between said liquid crystal layer and at least one of said pair of substrate; and	Tomioka discloses “[a]s shown in FIG. 1, the first embodiment of the liquid crystal display device 50 is composed of ... alignment layers 9, 11 of the liquid crystal formed on the surfaces in contact with the liquid crystal 10 of the substrates 1, 15” <i>Id.</i>, ¶86; <i>see also</i>, ¶108 (Ex 1 “will be

The '234 patent	<i>Tomioka, Nishikawa, Suzuki, Morii, and Kim</i>
	described below, referring to FIG. 1 and FIG. 2”). As to Ex 8, “[e]xcept the alignment layer used, a liquid crystal display device was formed using the same materials and the same processes as the embodied example 1.” <i>Id.</i> , ¶177.
optical means formed on at least one of said pair of substrates for changing the optical property of said liquid crystal layer in accordance with an alignment state of liquid crystal molecules of said liquid crystal layer;	Tomioka discloses “[a]s shown in FIG. 1, the first embodiment of the liquid crystal display device 50 is composed of ... a polarizing plate 16 of an optical means changing optical characteristic corresponding to an alignment state of the liquid crystal” <i>Id.</i> , ¶86; <i>see also</i> , ¶108 (Ex 1 “will be described below, referring to FIG. 1 and FIG. 2”). As to Ex 8, “[e]xcept the alignment layer used, a liquid crystal display device was formed using the same materials and the same processes as the embodied example 1.” <i>Id.</i> , ¶177.
wherein at least one of said alignment control films is an alignment control film comprising photoreactive polyimide and/or polyamic acid provided with an alignment control ability by irradiation of substantially linearly polarized light having a wavelength range from 200 nm to 400 nm;	Tomioka discloses: “the pair of alignment layer is a photo-reactive material layer. Furthermore, the alignment layer is formed by irradiating nearly linearly polarized light onto the layer made of the photo-reactive material.” <i>Id.</i> , ¶34. “In general, polyimide group materials are widely used for the alignment layer. The alignment layer of polyimide group material is usually formed by printing polyamic acid vanish of precursor of polyimide, and then a high heat resistance polyimide film is obtained through dehydration condensation reaction, that is, imidization reaction by curing treatment.” <i>Id.</i> , ¶64. As to Ex. 8, “photo alignment treatment [of the alignment layer of polyamic acid varnish] was performed by irradiating linearly polarized light of 313 nm wavelength onto the surface.” <i>Id.</i> , ¶177.
wherein said photoreactive alignment control film contains polyamic acid or polyimide comprising cyclobutanetetracarboxylic	Tomioka Ex 8 discloses: “[a] polyamic acid vanish composed of 4,4’-diamino-diphenyl methane as the diamine chemical compound and 1,2,3,4-cyclobutane-tetracarboxylic acid anhydride as the acid anhydride ... form[ed] an alignment

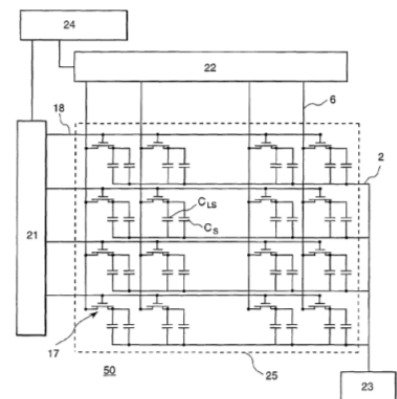
The '234 patent	<i>Tomioka, Nishikawa, Suzuki, Morii, and Kim</i>
acid dianhydride and/or its derivative and aromatic diamine; and	layer.” <i>Id.</i> , ¶177; <i>see also</i> , ¶¶32, 72-76.
wherein the cyclobutanetetracarboxylic acid dianhydride and/or its derivative is a compound represented by a formula [1]: where R₁, R₂, R₃, R₄ of the compound of formula [1] each represent a hydrogen atom, a fluorine atom, an alkyl group or alkoxyl group with a carbon number of 1 to 6, with the proviso that at least one of R₁, R₂, R₃ and R₄ of the compound of formula [1] is not hydrogen.	As to dianhydrides, Tomioka discloses: “[h]owever, the acid containing components and the other copolymeric components are not limited to the above.” <i>Id.</i>, ¶76. As to Ex. 8, the varnish is made from “1,2,3,4-cyclobutane-tetracarboxylic acid anhydride.” <i>Id.</i>, ¶177. Nishikawa discloses: “[o]f the above compounds, the following compounds are preferred from the viewpoint of achievement of good liquid crystal alignability ... are Particularly preferred are 1,2,3,4-cyclobutane-tetracarboxylic acid dianhydride, 1,3-dimethyl-1,2,3,4-cyclobutanetetra-carboxylic acid dianhydride” Ex. 1009, 5:42-66; <i>see also id.</i>, 23:45-48 (Syn Ex. 8, E1); Tble 1 (Ex. 9).
2. The liquid crystal display according to claim 1, wherein an alignment direction of the liquid crystal molecules of the liquid crystal layer on a surface of said alignment control film is in parallel with or orthogonal to a polarization axis of the substantially linearly polarized light for irradiation.	Tomioka Ex 8 discloses: “a good liquid crystal alignment in the vertical direction to the direction of the irradiation linearly polarized light was obtained.” Ex. 1008, ¶178.
3. The liquid crystal display according to claim 2, wherein said photoreactive alignment control film is polyamic acid or polyimide containing at least 50% of a repeated structure of polyamic acid or polyimide comprising said cyclobutanetetracarboxylic acid	Tomioka Ex 8 discloses: “[a] polyamic acid vanish composed of 4,4'-diamino-diphenyl methane as the diamine chemical compound and 1,2,3,4-cyclobutane-tetracarboxylic acid anhydride as the acid anhydride was printed on the surface of the substrate,

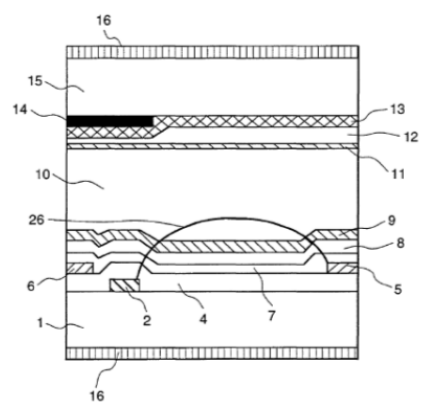
The '234 patent	Tomioka, Nishikawa, Suzuki, Morii, and Kim	
dianhydride and/or its derivative and said aromatic diamine.		and cured and imidized at 230 °C for 30 minutes to form an alignment layer.” <i>Id.</i> ¶177.
4. The liquid crystal display according to claim 3, wherein the aromatic diamine compound contains at least one of compounds selected from a group of compounds consisting of ones represented by formulas [2] to [16]: ... where R₁, R₂, R₃ and R₄ of the compounds represented by formulas [2] to [16] each independently represent a hydrogen atom, a fluorine atom, an alkyl group or alkoxyl group with a carbon number of 1 to 6, or vinyl group {—(CH₂)_m—CH=CH₂, m=0, 1, 2} or an acetyl group {—(CH₂)_n—C≡CH, n=0,1,2}, and in the formula [5], X represents a bond group —S—, —CO—, or —NH—.		Tomioka discloses of formula [2], [3], [5], [6], [16]: “For example, as aromatic diamine, there are p-phenylene diamine, m-phenylene diamine, 2,4-diaminotoluene, 2,5-diaminotoluene, 2,6-diaminotoluene, diaminodulene, benzidine, O-tolidine, 3,3'-dimethoxy benzidine, 4,4'-diaminotrphenyl, 1,5-diamin-naphtalene, 2,7-diaminofluorene, 4,4'-diaminodiphenyl ether, 4,4'-diaminodiphenyl sulfide, ...” <i>Id.</i>, ¶74 (emphasis added), <i>see also</i>, ¶75 (However, the amine containing components and the other copolymeric components are not limited to the above.)
5. The liquid crystal display according to claim 1, wherein said alignment control film comprising the polyimide material has a thickness from 1 nm to 100 nm. 6. The liquid crystal display according to claim 1, wherein said alignment control film has a thickness from 1 nm to 50 nm above the electrodes constituting said group of electrodes.		Tomioka Ex 8 discloses: “to form an alignment layer which had a film thickness of about 50 nm.” <i>Id.</i>, ¶177.
7. The liquid crystal display according to claim 1, wherein said alignment control film has a thickness from 1 nm to 30 nm above the electrodes constituting said group of electrodes.		Tomioka Ex 8 discloses: “to form an alignment layer which had a film thickness of about 50 nm.” <i>Id.</i>, ¶177. Chaudhari discloses: “[w]hen charge accumulates on a portion the alignment film, nearby liquid crystal molecules are exposed to a residual voltage after the applied voltage is switched off ... In such regions, the displayed image is retained after the applied voltage is switched off. This is known as image sticking.” Ex. 1010, ¶11. “[T]o provide a liquid crystal display device in which image sticking is significantly reduced or eliminated. The LCD device is formed with a very thin alignment film that allows for charge

The '234 patent	<i>Tomioka, Nishikawa, Suzuki, Morii, and Kim</i>
	hopping or tunneling. This significantly reduces charge accumulation so that image sticking is greatly minimized or eliminated.” <i>Id.</i> , ¶12. “A first alignment layer having a thickness of 100 Å [i.e., 10 nm] or less overlies the first electrode layer.” <i>Id.</i> , ¶13. “As shown in FIG. 4, when 100 Å [i.e., 10 nm] thick ion beam-aligned polyimide alignment layers are used, there is no observable image sticking.” <i>Id.</i> , ¶ 27.
8. The liquid crystal display according to claim 1, wherein the alignment control film has a glass transition temperature equal to or higher than 250° C.	Tomioka discloses: “it is found that the alignment layers having a Tg exceeding 220 °C can reduce the after image to a degree which can satisfy an allowable value of display performance.” Ex. 1008, ¶73.
9. The liquid crystal display according to claim 1, wherein said liquid crystal layer has a pretilt angle equal to or smaller than one degree.	Tomioka discloses: “a polymer for the alignment layer can suppress the pretilt angle (interface tilt angle) to a low angle below 5 degrees.” <i>Id.</i> , ¶72. As to Ex 8: “the pretilt angle was measured though the crystal rotation method, and the measured result was about 1 degree.” <i>Id.</i> , ¶179.
10. The liquid crystal display according to claim 1, wherein said group of electrodes has a pixel electrode and a common electrode, and at least one of the pixel electrode and the common electrode is formed of a transparent electrode. 11. The liquid crystal display according to claim 10, wherein the transparent electrode is formed of an ion-doped titanium oxide film or an ion-doped zinc oxide film.	Tomioka discloses: “[f]urther, in the liquid crystal display device, at least one of the pixel electrode and the common electrode is formed of a transparent electric conductive film. The transparent electric conductive film is an ion doped titanium oxide film or an ion doped zinc oxide (ZnO) film.” <i>Id.</i> , ¶36; <i>see also</i> , ¶¶[0056], [0112]. As to Ex 8, “[e]xcept the alignment layer used, a liquid crystal display device was formed using the same materials and the same processes as the embodied example 1.” <i>Id.</i> , ¶177.
12. The liquid crystal display according to claim 10, wherein the common electrode or a wire for the common electrode or a wire for a signal is made of Al, Cr, Mo, Ta, W or an alloy	Tomioka Ex 1 discloses: “[t]he common electrode 2 and the scanning electrode 18 are aluminum films” <i>Id.</i> , ¶111. As to Ex 8, “[e]xcept the alignment layer used, a liquid crystal display device was formed using the same materials and the same processes as the

The '234 patent	<i>Tomioka, Nishikawa, Suzuki, Morii, and Kim</i>
containing any one of them.	embodied example 1.” <i>Id.</i> , ¶177.
13. The liquid crystal display according to claim 10, wherein the pixel electrode and the common electrode opposite thereto are disposed in parallel with each other and each have a bending structure.	Suzuki discloses: “[a] source electrode 71 and a common electrode 72 for generating a liquid crystal activating electric field are each of a substantial shape comprising a horizontal ladder structure as viewed in FIG. 4. The ladder structure has crosspieces that are bent to a V shape along the drain bus lines 56 in each of the pixel regions” Ex. 1011, ¶75. “In FIG. 4, the drain bus lines 56 are bent in their vertical direction such that each of the pixel regions in the two-dimensional matrix is of a V shape.” <i>Id.</i>, ¶74. “When the liquid crystal display unit is in a bright display state ... the orientations of the liquid crystal molecules 21 in the two auxiliary regions lie at 90° with respect to each other. Therefore, the directions in which displayed images look bluish and reddish compensate for each other, thereby suppressing tints of the displayed images due to changes in the angle of view.” <i>Id.</i>, ¶80. 
14. The liquid crystal display according to claim 10, wherein the common electrode and/or the pixel electrode is formed on an organic insulating film, and said liquid crystal alignment film is formed on the organic insulating film and the group of electrodes.	Morii’s “Fig. 6 is a sectional explanatory view of an IPS panel according to Embodiment 2.” (Ex. 1012, 10:50-51.) As shown in Fig. 6, alignment layer 23 was formed on the electrodes 2 and film 16. (<i>Id.</i>, Fig. 6, 10:6-9 & 58-59, 11:15-25.) Morii discloses that “[t]he flattening film 16 is of an organic film of, for instance, photosensitive acrylic resin or of acrylic resin.” (<i>Id.</i>, 9:40-42.) Morii further states that “[w]ith this arrangement [of Fig. 6], irregularities in color which occurred on conventional IPS panels could be eliminated and an IPS panel of high display quality as a display could be manufactured.” (<i>Id.</i>, 11:45-56.) 
15. The liquid crystal display according to claim 1, wherein said liquid crystal	Tomioka discloses: “in the liquid crystal display device, the alignment control

The '234 patent	<i>Tomioka, Nishikawa, Suzuki, Morii, and Kim</i>
molecules have substantially the same alignment control directions at two interfaces between said liquid crystal layer and said alignment control film formed on each of said paired substrates.	directions of the liquid crystal in the two interfaces between the liquid crystal layer and the pair of substrates are nearly equal to each other.” Ex. 1008, ¶37.
16. A method of producing a liquid crystal display, comprising the steps of:	Tomioka Ex. 8 discloses: “a liquid crystal display device was formed” <i>Id.</i> , ¶177; <i>see also</i> , ¶¶108, 120, FIG 1.
forming a group of electrodes on one substrate and configuring the group of electrode so as to apply an electric field having a component substantially in parallel with a surface of the one substrate;	Tomioka discloses: “As shown in FIG. 1 ... a common electrode 2 and pixel electrode 5 formed on the substrate 1 so as to apply a voltage between them to generate an electric field having a component parallel to the substrate surface as schematically shown by the reference character 26 in the figure” <i>Id.</i> , ¶86 (emphasis added); <i>see also</i> , ¶108 (Ex 1 “will be described below, referring to FIG. 1 and FIG. 2”). As to Ex 8, “[e]xcept the alignment layer used, a liquid crystal display device was formed using the same materials and the same processes as the embodied example 1.” <i>Id.</i> , ¶177.
forming a plurality of active devices on the one substrate which are connected to the group of electrodes;	Tomioka discloses: “[a]s shown in FIG. 1 and FIG. 2, ... an active element of a thin film transistor (TFT) 17 formed in the substrate 1” <i>Id.</i> , ¶86. “In the first embodiment of the liquid crystal display device 50, an electric field 26 is generated between the common electrode 2 and the pixel electrode 5 by an ac tion of the thin film transistor 17 to induce switching-motion of the liquid crystal molecules” <i>Id.</i> , ¶87; <i>see also</i> , ¶¶108 (Ex 1 “will be described



The '234 patent	<i>Tomioka, Nishikawa, Suzuki, Morii, and Kim</i>
	below, referring to FIG. 1 and FIG. 2”), 109. As to Ex 8, “[e]xcept the alignment layer used, a liquid crystal display device was formed using the same materials and the same processes as the embodied example 1.” <i>Id.</i>, ¶177. FIG. 9 shows a plurality of thin film transistor 17
sandwiching a liquid crystal layer between a pair of substrates including the one substrate and another substrate so as to enable the group of electrodes to apply the electric field having the component substantially in parallel to the surface of the one substrate to the liquid crystal layer, at least one of the substrates being transparent; and	Tomioka discloses: “[a]s shown in FIG. 1 and FIG. 2, the first embodiment of the liquid crystal display device 50 is composed of a pair of transparent glass substrates 1, 15; liquid crystal 10 interposed between the substrates 1, 15.” Ex. 1001, ¶89; see also, ¶¶13, 108 (Ex 1 “will be described below, referring to FIG. 1 and FIG. 2”), 109, 116, 119 & Abstract. As to Ex 8, “[e]xcept the alignment layer used, a liquid crystal display device was formed using the same materials and the same processes as the embodied example 1.” <i>Id.</i>, ¶177 
disposing an alignment control film between the liquid crystal layer and at least one of the pair of substrates,	Tomioka discloses “[a]s shown in FIG. 1, the first embodiment of the liquid crystal display device 50 is composed of ... alignment layers 9, 11 of the liquid crystal formed on the surfaces in contact with the liquid crystal 10 of the substrates 1, 15 ...” <i>Id.</i>, ¶86; see also, ¶108 (Ex 1 “will be described below, referring to FIG. 1 and FIG. 2”). As to Ex 8, “[e]xcept the alignment layer used, a liquid crystal display device was formed using the same materials and the same processes as the embodied example 1.” <i>Id.</i>, ¶177.
the alignment control film comprising photoreactive polyimide and/or polyamic	Tomioka discloses: “the pair of alignment layer is a photo-reactive material layer. Furthermore, the alignment layer is formed by irradiating nearly

The '234 patent	<i>Tomioka, Nishikawa, Suzuki, Morii, and Kim</i>
acid provided with an alignment control ability by irradiation of substantially linearly polarized light;	linearly polarized light onto the layer made of the photo-reactive material.” <i>Id.</i> , ¶34. “In general, polyimide group materials are widely used for the alignment layer. The alignment layer of polyimide group material is usually formed by printing polyamic acid vanish of precursor of polyimide, and then a high heat resistance polyimide film is obtained through dehydration condensation reaction, that is, imidization reaction by curing treatment.” <i>Id.</i> , ¶64.
the liquid crystal display having optical means formed on at least one of the pair of substrates for changing the optical property of the liquid crystal layer in accordance with an alignment state of molecules of the liquid crystal layer,	Tomioka discloses: “[a]s shown in FIG. 1, the first embodiment of the liquid crystal display device 50 is composed of . . . a polarizing plate 16 of an optical means changing optical characteristic corresponding to an alignment state of the liquid crystal . . .” <i>Id.</i> , ¶86; <i>see also</i> , ¶108 (Ex 1 “will be described below, referring to FIG. 1 and FIG. 2”). As to Ex 8, “[e]xcept the alignment layer used, a liquid crystal display device was formed using the same materials and the same processes as the embodied example 1.” <i>Id.</i> , ¶177.
wherein the polarized light for irradiation of the liquid crystal alignment control film has a wavelength range from 200 nm to 400 nm;	As to Ex. 8, “photo alignment treatment [of the alignment layer of polyamic acid varnish] was performed by irradiating linearly polarized light of 313 nm wavelength onto the surface.” <i>Id.</i> , ¶177.
wherein said photoreactive alignment control film contains polyamic acid or polyimide comprising cyclobutanetetracarboxylic acid dianhydride and/or its derivative and aromatic diamine; and	Tomioka Ex 8 discloses: “A polyamic acid vanish composed of 4,4’-diamino-diphenyl methane as the diamine chemical compound and 1,2,3,4-cyclobutane-tetracarboxylic acid anhydride as the acid anhydride . . . form[ed] an alignment layer.” <i>Id.</i> , ¶177; <i>see also</i> , ¶¶32, 72-76.
wherein the cyclobutanetetracarboxylic acid dianhydride and/or its derivative is a compound represented by a	As to dianhydrides, Tomioka discloses: “[h]owever, the acid containing components and the other copolymeric components are not limited to the above.” <i>Id.</i> , ¶76. As to Ex. 8, the varnish is

The '234 patent	Tomioka, Nishikawa, Suzuki, Morii, and Kim
formula [1]: where R₁, R₂, R₃, R₄ of the compound of formula [1] each represent a hydrogen atom, a fluorine atom, an alkyl group or alkoxyl group with a carbon number of 1 to 6, with the proviso that at least one of R₁, R₂, R₃ and R₄ of the compound of formula [1] is not hydrogen.	made from “1,2,3,4-cyclobutane-tetracarboxylic acid anhydride.” <i>Id.</i>, ¶177. Nishikawa discloses: “[o]f the above compounds, the following compounds are preferred from the viewpoint of achievement of good liquid crystal alignability ... are Particularly preferred are 1,2,3,4-cyclobutanetetra-carboxylic acid dianhydride, 1,3-dimethyl-1,2,3,4-cyclobutanetetracarboxylic acid dianhydride” Ex. 1009, 5:42-66; <i>see also id.</i>, 23:45-48 (Syn Ex. 8, E1); Tble 1 (Ex. 9).
23. The liquid crystal display according to claim 1, wherein the cyclobutanetetracarboxylic acid dianhydride and/or its derivative is a compound represented by a formula [1]: wherein R₁, R₂ of the compound of formula [1] each represent a fluorine atom, an alkyl group or alkoxyl group with a carbon number of 1 to 6.	As to dianhydrides, Tomioka discloses: “[h]owever, the acid containing components and the other copolymeric components are not limited to the above.” <i>Id.</i>, ¶76. Nishikawa discloses: “[a]s the tetracarboxylic acid dianhydride used in the synthesis of the above polyamic acid, there can be mentioned, for example, aliphatic or alicyclic tetracarboxylic acid dianhydrides such as butanetetracarboxylic acid dianhydride, 1,2,3,4-cyclobutanetetracarboxylic acid dianhydride, 1,2-dimethyl-1,2,3,4-cyclobutanetetracarboxylic acid dianhydride, 1,3-dimethyl-1,2,3,4-cyclobutanetetracarboxylic acid dianhydride” Ex. 1009, 2:31-38.
24. The liquid crystal display according to claim 1, wherein the alignment control ability of said alignment control film is promoted and stabilized by	Tomioka discloses as to Ex. 8: “photo alignment treatment [of the alignment layer of polyamic acid varnish] was performed by irradiating linearly polarized light of 313 nm wavelength onto the surface.” <i>Id.</i>, ¶177.

The '234 patent	<i>Tomioka, Nishikawa, Suzuki, Morii, and Kim</i>
heating, irradiation of infrared rays, irradiation of far infrared rays, irradiation of electron beams, or irradiation of radioactive rays to said alignment control film.	Kim discloses: “we exposed [linearly polarized UV light] for 30 min during thermal imidization (or hard bake) at 250 °C.” Ex. 1013, p.3372. “[S]amples prepared by this method have better thermal stability and requires less processing time.” <i>Id.</i> , p.3374.

VIII. Conclusion

For these reasons, the challenged claims are unpatentable and Petitioner requests that the Board grant this Petition and institute trial.

IX. Mandatory Notices Under 37 C.F.R. § 42.8

A. Real Parties-in-Interest

The real parties-in-interest are: Tianma Micro-electronics Co., Ltd., Xiamen Tianma Micro-electronics Co., Ltd., and NLT Technologies, Ltd.

B. Related Matters

Petitioner has filed concurrently a petition for *inter partes* review of U.S. Patent No. 8,758,871 (Ex. 1004), which is the grand-child of the '234 patent. Petitioner is not aware of any other related matters that would affect or be affected by this proceeding.

C. Lead and Back-up Counsel, and Service Information

Petitioner identifies James R. Barney (Reg. No. 46,539) as lead counsel, and Anthony A. Hartmann (Reg. No. 43,662) and Shing-Yi Cheng (Reg. No. 63,401) as back-up counsels. All counsel can be reached at Finnegan, Henderson, Farabow,

Petition for *Inter Partes* Review
U.S. Patent No. 7,718,234

Garrett & Dunner, LLP, 901 New York Avenue, N.W., Washington, D.C. 20001-

4413. Mr. Barney can be reached at (202) 408-4412 and

james.barney@finnegan.com; and Mr. Hartmann at (202) 408-4275 and

anthony.hartmann@finnegan.com. Petitioner consents to e-mail service at

TIANMAIPRS@finnegan.com.

X. Payment of Fees Under 37 C.F.R. §§42.15(a) and 42.103(a)

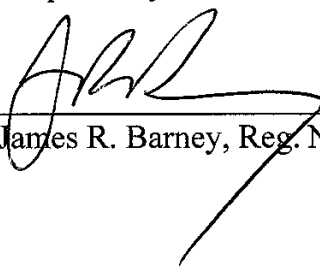
The required fees are submitted herewith. If any additional fees are due during this proceeding, the Office is authorized to charge those fees to Deposit Account No. 06-0916.

XI. Grounds for Standing

Petitioner certifies that the '234 patent is available for *inter partes* review and that Petitioner is not barred or estopped from requesting an *inter partes* review challenging the patent claims on the grounds identified in this Petition.

Date: April 29, 2016

Respectfully submitted,



James R. Barney, Reg. No. 46,539

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(a), this is to certify that on April 29, 2016, I caused to be served true and correct copies of the foregoing, **PETITION FOR *INTER PARTES* REVIEW and the associated Exhibits**, by Express Mail on the Patent Owner at the correspondence address of record for the U.S. Patent No. 7,718,234, as follows:

Antonelli Terry Stout & Kraus, LLP
PO Box 472
Upper Marlboro MD 20773

Typha IP LLC
1819 L Street NW, Suite 200
Washington DC 20036

Dated: April 29, 2016

Respectfully submitted,

By: /James Barney/
James Barney, Lead Counsel
Reg. No. 46,539
Counsel for Petitioner