

HIGH-PERFORMANCE FILM MARKET 2011

-Market Prospects and Strategies-

 **Yano Research Institute Ltd.**

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Chapter 3

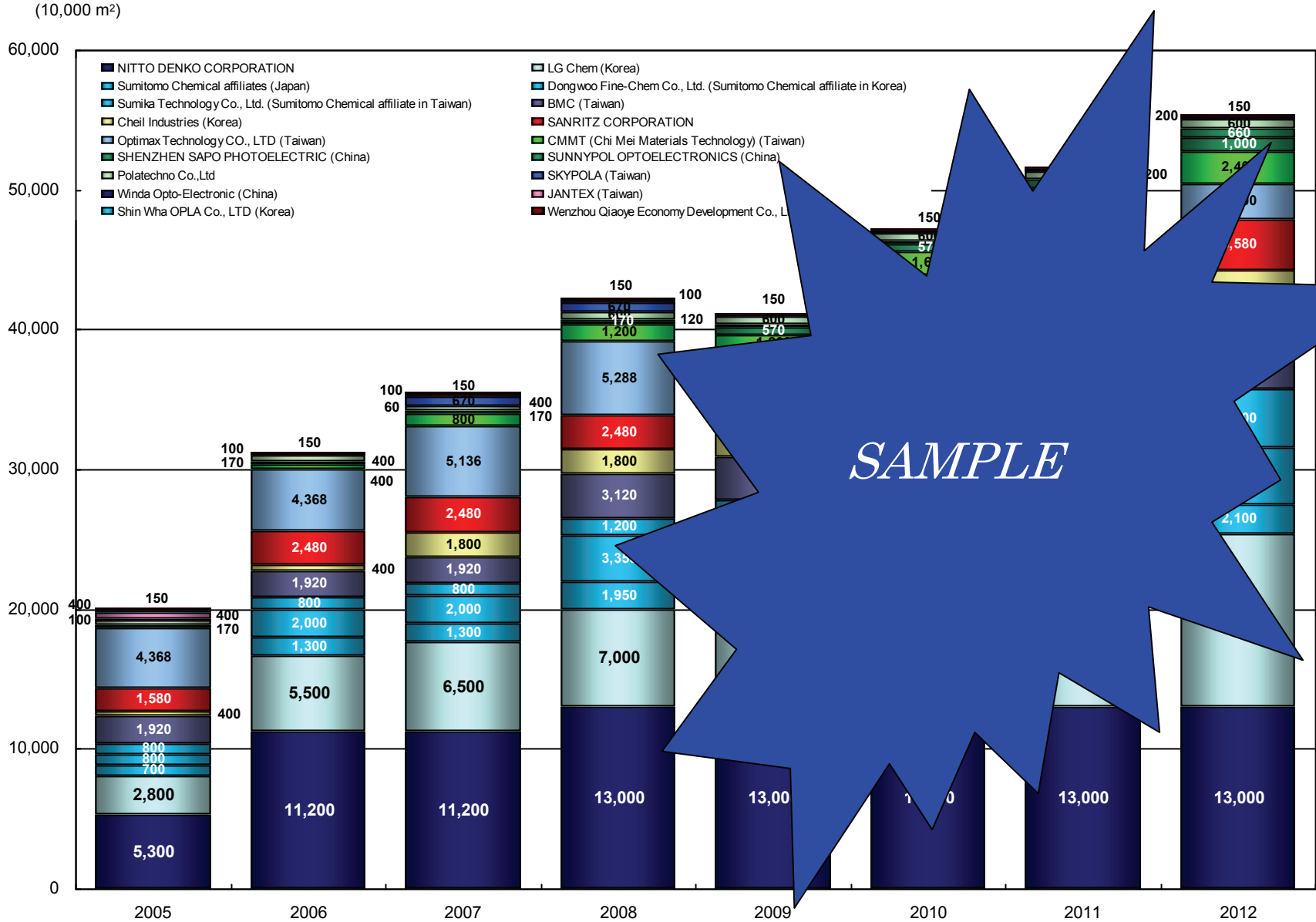
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Research analysis, report writing and editing by :

Hatsumi Yano
Tomoko Funaki
Kazuo Tamura

1-1-3. Production Capacity and Shares of the World's Major Polarizer Manufacturers



1-1-4. Production Volume and Sales of Polarizers by LCD Type

(Unit: 10,000 m²/year)

	FY2008		FY2009		FY2010		FY2011 (forecast)		FY2012 (forecast)		FY2013 (forecast)	
	Production volume	ratio	Production volume	ratio	Production volume	ratio	Production volume	ratio	Production volume	ratio	Production volume	ratio
TFT	22,760	97.2%	22,760	97.2%	4,510	96.7%	4,510	96.8%	5,000	97.1%	5,000	97.1%
STN	285		285		285	2.6%	285	2.4%	285		285	2.3%
TN	370		370		370		370		370		370	
Total												100.0%
Year-on-year ratio												100.6%

Sales in Value (100 million yen)												12,600
Average unit price (yen/m ²)					2,000							1,300
Year-on-year ratio					94.8%				95.0%			95.0%

- * Based on Roll.
- * Sales include products other than polarizer (e.g. ITO film and optical components).
- * Average unit price = (Sales in value) / (Production volume)
- * Year-on-year ratio for 2012 and 2013 is assumed as 95%.

1-1-7. Production Volume by Polarizer Manufacturer and LCD Mode in 2012 (Forecast)

(Unit: 10,000 m²/year)

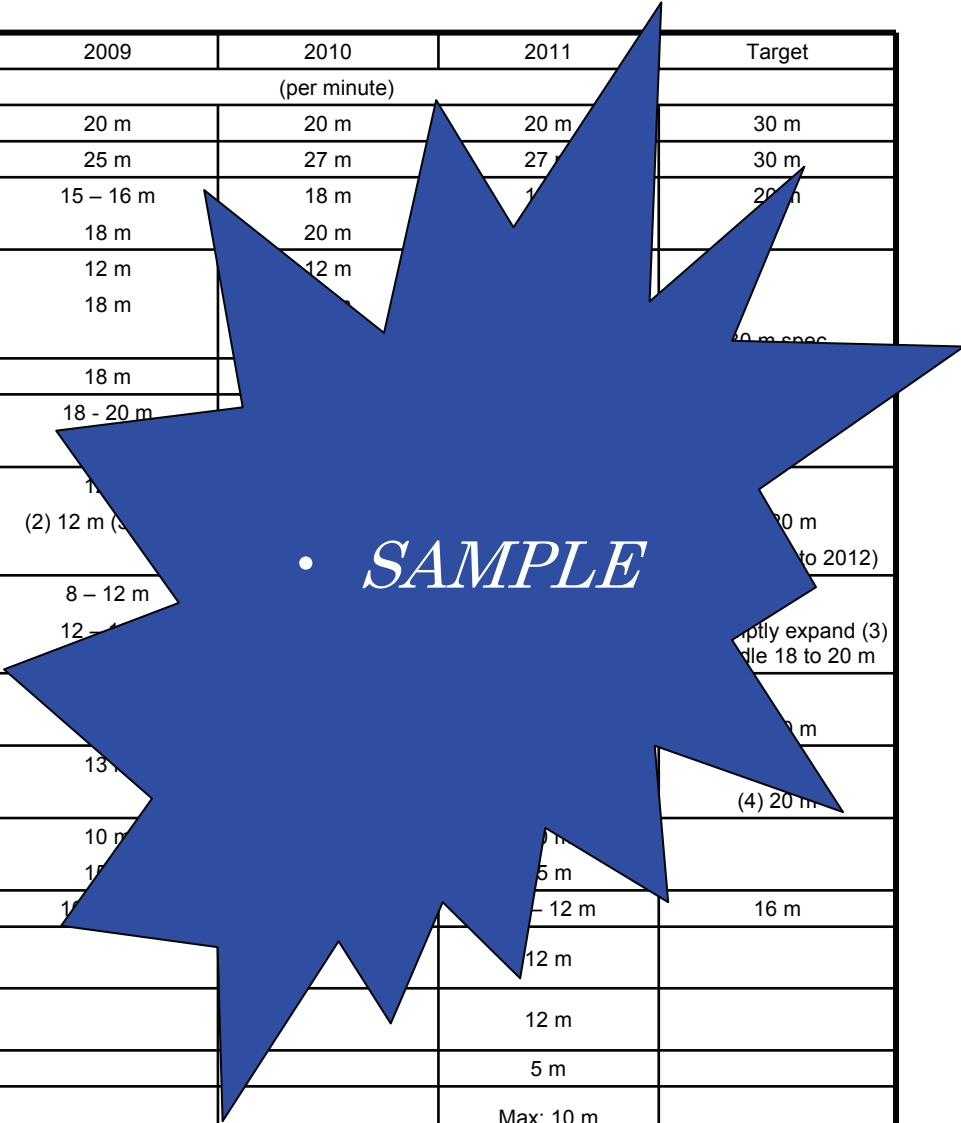
Manufacturers	Capacity	TN		STN		TFT		Total	
		share	share	share	share	share	share		
NITTO DENKO CORPORATION	13,000	-	-	-	-	11,000	24.1%	11,000	23.4%
LG Chem	12,400	-	-	-	-	11,000	24.1%	11,000	23.4%
Sumitomo Chemical Co., Ltd	10,000	-	-	-	-	7,400	16.2%	7,400	16.7%
BMC	8,000	-	-	-	-	4,500	9.6%	4,500	9.6%
CMMT	6,000	-	-	-	-	3,800	8.1%	3,800	8.1%
SANRITZ CORPORATION	5,000	-	-	-	-	5,000	10.6%	5,000	10.6%
Cheil Industries, Inc.	4,000	-	-	-	-	4,000	8.1%	4,000	8.1%
Optimax Technology CO.	3,000	-	-	-	-	3,000	6.2%	3,000	6.2%
Polatechno Co.,Ltd	2,000	-	-	-	-	2,000	4.1%	2,000	4.1%
SUNNYPOL OPTOELECTRONICS	1,500	-	-	-	-	1,500	3.1%	1,500	3.1%
SHENZHEN SAPO PHOTOELECTRONICS	1,000	-	-	-	-	1,000	2.1%	1,000	2.1%
Winda Opto-Electronic	500	-	-	-	-	500	1.1%	500	1.1%
Wenzhou Qiaoye Economy Development Co., Ltd	300	6.9%	100%	100%	100%	300	0.6%	300	0.6%
Total	19,070	290	100.0%	1,080	100.0%	19,070	100.0%	19,070	100.0%
ratio		0.6%						100.0%	

Note) Production volume is based on Roll, computed in consideration of production capacity, operation period and other factors.
 STN includes applications for 3D glasses.

[Estimated by Yano Research Institute]

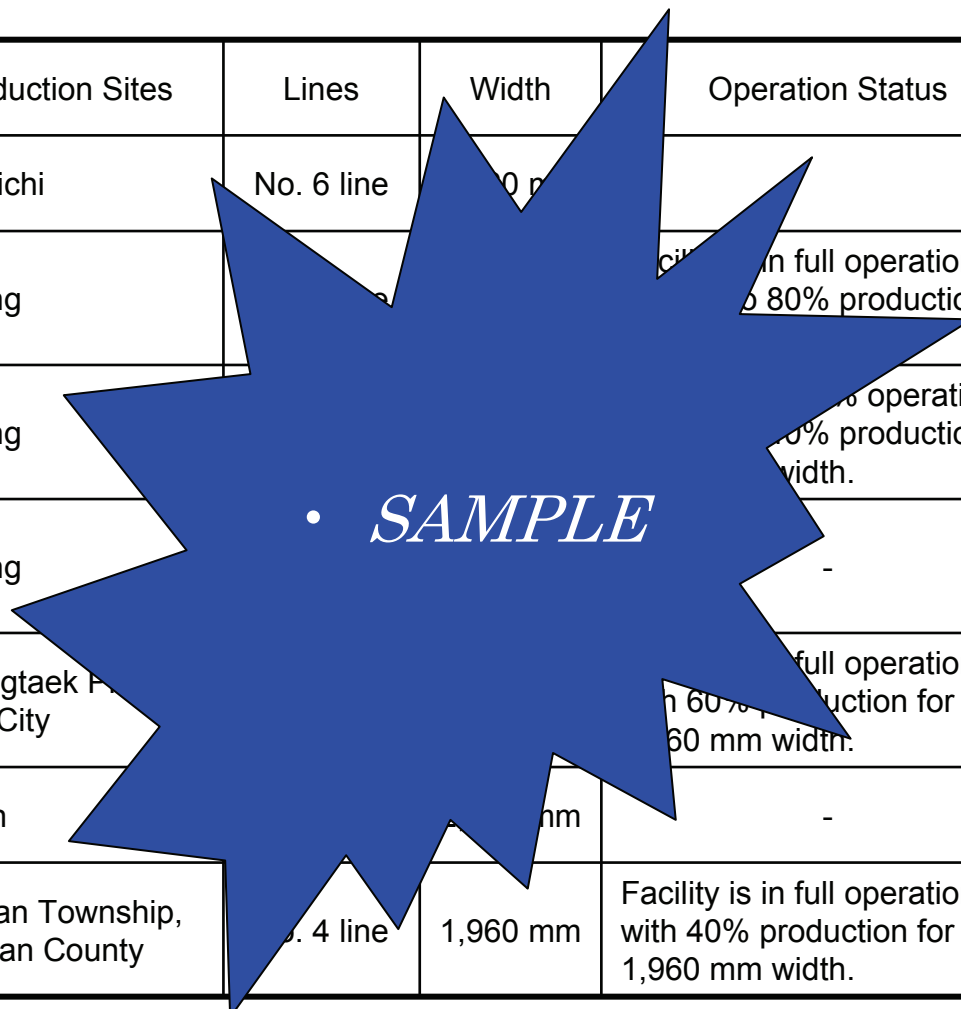
1-1-10. Comparison of Production Rate of Polarizer Manufacturers

	Plant/Line	2008	2009	2010	2011	Target
		(per minute)				
NITTO DENKO CORPORATION	Existing line	20 m	20 m	20 m	20 m	30 m
	New Onomichi process (2 lines)	25 m	25 m	27 m	27 m	30 m
Sumitomo Chemical Co., Ltd	Existing line	15 - 16m	15 - 16 m	18 m	18 m	20 m
	With the latest technology (Ehime)	18 m	18 m	20 m	20 m	20 m
Dongwoo Fine-Chem	(1)	12 m	12 m	12 m	12 m	12 m
	(2)	18 m	18 m	18 m	18 m	18 m
	(3)(4)(5)	18 m	18 m	18 m	18 m	18 m
Sumika Technology	(1)(2)	18 m	18 m	18 m	18 m	18 m
LG Chem	(2) - (7)	18 m	18 - 20 m	18 m	18 m	18 m
	(8) - (10)	18 m	18 - 20 m	18 m	18 m	18 m
BMC	(1)	12 m	12 m	12 m	12 m	12 m
	(2)(3)(4)	(2) 12 m (3) 16 m	(2) 12 m (3) 16 m	12 m	12 m	12 m
	Tainan (8)(9)	12 m	12 m	12 m	12 m	12 m
SANRITZ CORPORATION	Toyama (1)(2)	8 - 10 m	8 - 12 m	8 m	8 m	8 m
	Nyuzen (3)	12 m	12 m	12 m	12 m	12 m
Cheil Industries, Inc.		12 m	12 m	12 m	12 m	12 m
CMMT	(1)(2)(3)	6 - 8 m	13 m	13 m	13 m	13 m
	(4)	13 m	13 m	13 m	13 m	(4) 20 m
Polatechno Co.,Ltd	(1)(2)	10 m	10 m	10 m	10 m	10 m
	(3)	10 m	10 m	10 m	10 m	10 m
Optimax Technology CO.		10 - 12 m	10 - 12 m	10 - 12 m	10 - 12 m	16 m
SHENZHEN SAPO PHOTOELECTRIC	(4)				12 m	
SUNNYPOL OPTOELECTRONICS	(3)				12 m	
Winda Opto-Electronic	(1)(2)				5 m	
Wenzhou Qiaoye Economy Development Co., Ltd	(1)				Max: 10 m	



1-1-11. Wide Line Operations of Polarizer Manufacturers

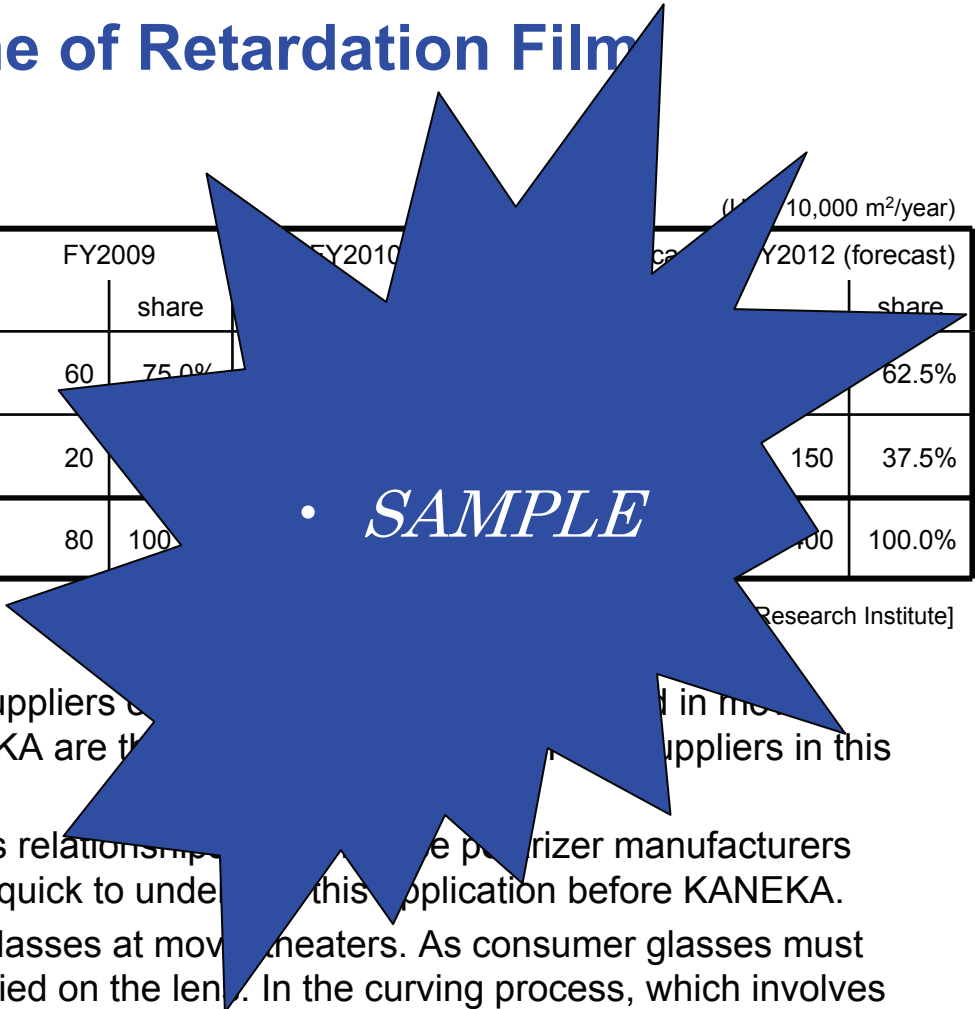
Name of Manufacturer	Operation Period	Production Sites	Lines	Width	Operation Status
NITTO DENKO CORPORATION	June 2008	Onomichi	No. 6 line	1,960 mm	Facility is in full operation with 80% production for 1,960 mm width.
LG Chem	March 2009	Ochang	No. 5 line	1,960 mm	Facility is in full operation with 80% production for 1,960 mm width.
	August 2010	Ochang	No. 6 line	1,960 mm	Facility is in full operation with 80% production for 1,960 mm width.
	Scheduled to start operation at the end of 2012.	Ochang	No. 7 line	1,960 mm	-
Dongwoo Fine-Chem	April 2009	Pyeongtaek P.O. Iksan City	No. 1 line	1,960 mm	Facility is in full operation with 60% production for 1,960 mm width.
Sumika Technology	2012?	Tainan	No. 1 line	1,960 mm	-
BenQ Materials Corp.	June 2009	Guishan Township, Taoyuan County	No. 4 line	1,960 mm	Facility is in full operation with 40% production for 1,960 mm width.



[Estimated by Yano Research Institute]

1-3-10. Annual Sales Volume of Retardation Film for 3D Glasses

	FY2007		FY2008		FY2009		FY2010		FY2011		FY2012 (forecast)	
	Volume (10,000 m ² /year)	share	Volume (10,000 m ² /year)	share	Volume (10,000 m ² /year)	share	Volume (10,000 m ² /year)	share	Volume (10,000 m ² /year)	share	Volume (10,000 m ² /year)	share
TEIJIN CHEMICALS LTD.	50	100.0%	60	100.0%	60	75.0%	80	100.0%	100	100.0%	150	62.5%
KANEKA CORPORATION	-	-	-	-	20	25.0%	0	0.0%	0	0.0%	150	37.5%
Total	50	100.0%	60	100.0%	80	100.0%	80	100.0%	100	100.0%	150	100.0%



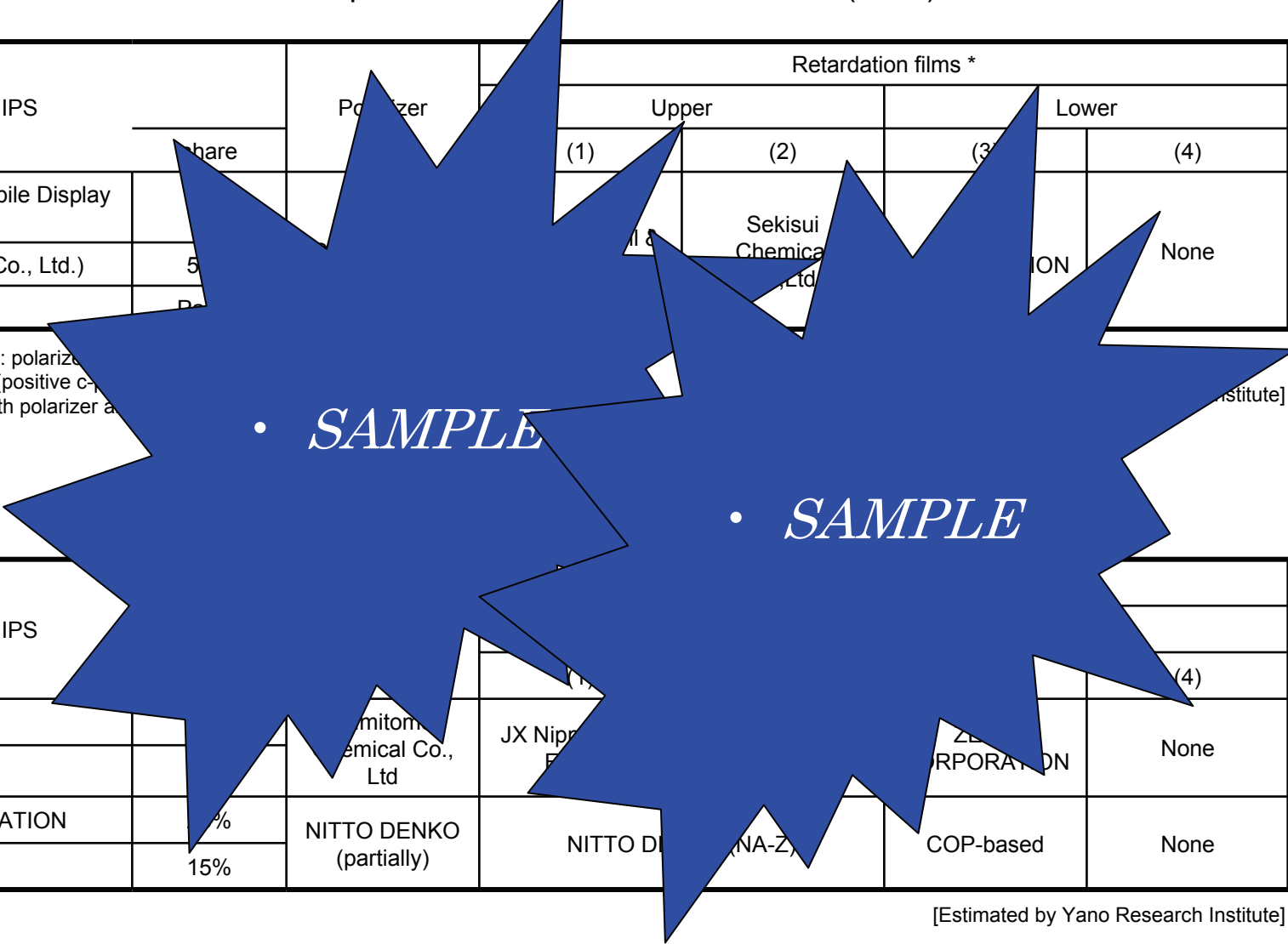
- Chinese manufacturers are the primary suppliers of retardation film in movie theaters. TEIJIN CHEMICALS and KANEKA are the main suppliers in this segment.
- TEIJIN CHEMICALS took advantage of its relationship with the polarizer manufacturers fostered through dealing in STN and was quick to understand this application before KANEKA.
- People will soon have their personal 3D glasses at movie theaters. As consumer glasses must offer good design, curving process is applied on the lens. In the curving process, which involves applying heat of about 110 degrees centigrade, polycarbonate film is not suitable due to the inconsistency formed given the photoelastic coefficient. This is why COP is applied although it is vulnerable to oil and hence for example, touching the lens after eating potato chips can cause the lens to crack. Hence the hard coat layer is added. Generally, COP does not offer high adhesiveness with other materials and requires surface processing. With costs associated with resin, surface processing and hard coating, the product becomes quite expensive compared to PC-based retardation film. This is a major drawback.

1-3-19. Status of Material Manufacturers for iPhone 4

Status of Component Manufacturers for iPhone 4 (2010)

3.5" Panel IPS	Share	Polarizer	Retardation films *			
			Upper		Lower	
			(1)	(2)	(3)	(4)
TMD (Toshiba Mobile Display Co., Ltd.)				Sekisui Chemical Co., Ltd.		
LGD (LG Display Co., Ltd.)	5%				None	
Seiko Epson Corp.						

* Composition of cell: polarizer (1) NV film 13 μm (positive charge) 100% share for both polarizer and retardation films [Estimated by Yano Research Institute]



3.5" Panel IPS	Share	Polarizer	Retardation films *			
			Upper		Lower	
			(1)	(2)	(3)	(4)
TMD		Sumitomo Chemical Co., Ltd.	JX Nippon Energy Ex.		ZEON CORPORATION	None
LGD						
SHARP CORPORATION	15%	NITTO DENKO (partially)	NITTO DENKO (NA-Z)		COP-based	None
CIC						

[Estimated by Yano Research Institute]

1-3-20. Status of Component Manufacturers for iPad

Status of Component Manufacturers for iPad (2010)

9.7" Panel IPS	share	polarizer	Retardation films
LGD	90%		FUJIFILM (Z-TAC)
Samsung Electronics Co.,Ltd			Zeon (Zero-TAC)
Seiko Epson Corp			Zeon (Zero-TAC)

* Composition of cell: p

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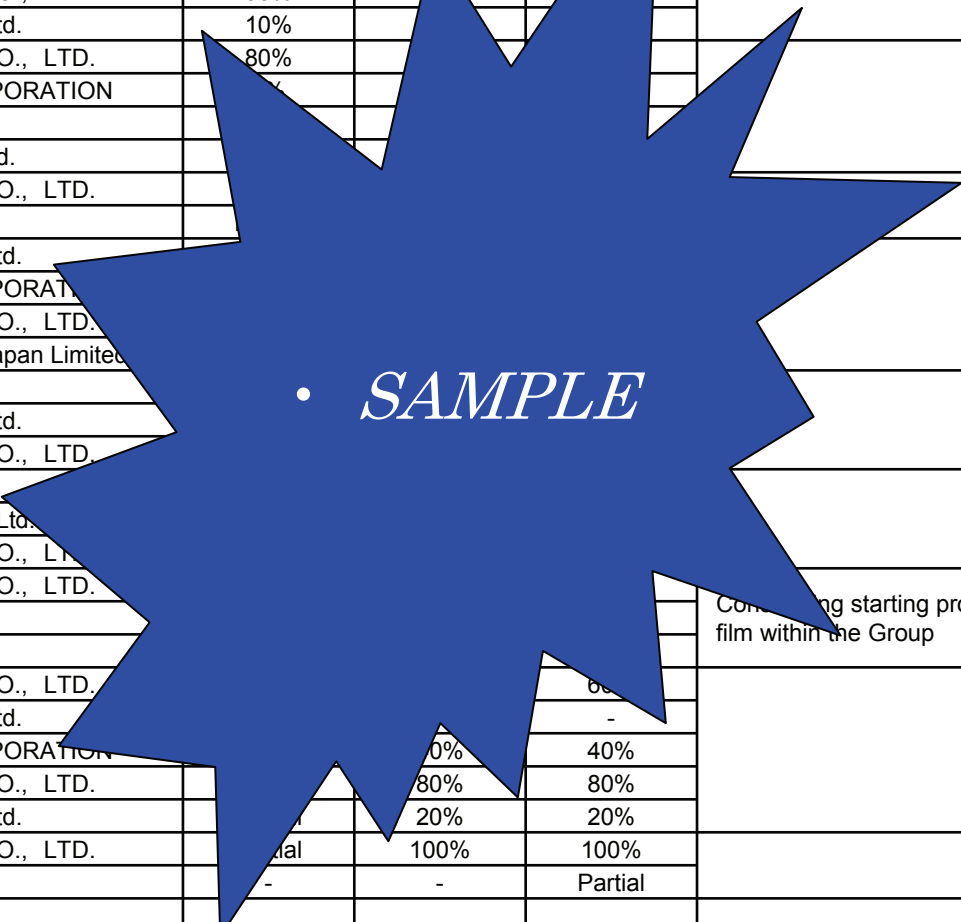
9.7" Panel IPS			
LGD		NITTO DENKO CORPORATION	FUJIFILM (Z-TAC)
Samsung Electronics Co.,Ltd		NITTO DENKO CORPORATION	ZEON CORPORATION (G film)

* Sumitomo Chemical is expected to enter the market in the latter half of 2011. LGD and Samsung Electronics will each hold 50% share. ZEON is strong in retardation film (G film). LG Chem will also enter the market of lower polarizers in the latter half of 2011. FUJIFILM () handles retardation film while NITTO DENKO handles upper polarizer.

[Estimated by Yano Research Institute]

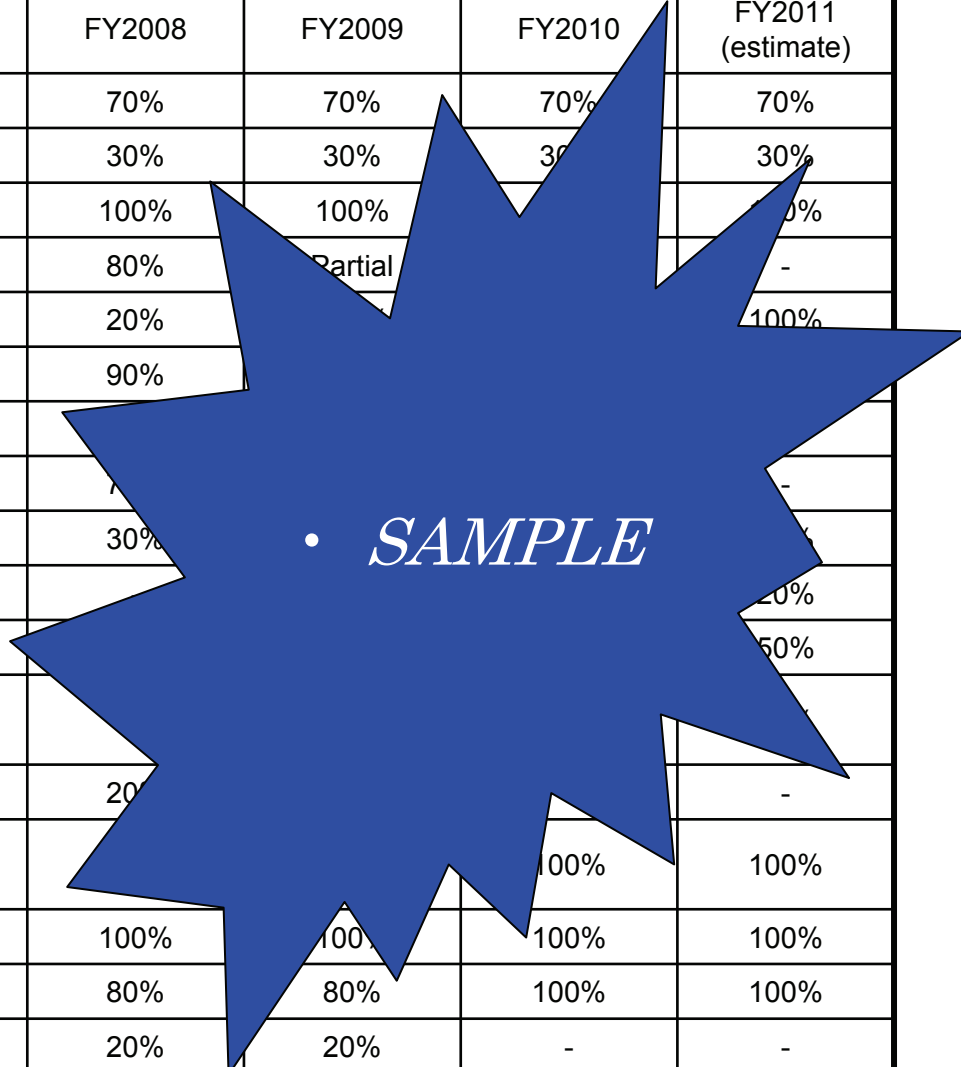
1-5-2. Shares of PET Protect Film Manufacturers at LCD Polarizer Manufacturers

Polarizer Manufacturers	Protect Film Manufacturers	FY2009	FY2010	FY2011 (estimated)	Remarks
NITTO DENKO CORPORATION	In-house	85%	95%	95%	
	FUJIMORI KOGYO CO., LTD.	15%	5%		
SANRITZ CORPORATION	FUJIMORI KOGYO CO., LTD.	90%	90%		
	SUN A KAKEN Co., Ltd.	10%			
Sumitomo Chemical Co., Ltd	FUJIMORI KOGYO CO., LTD.	80%			
	NITTO DENKO CORPORATION				
	LINTEC Corporation				
Polatechno Co.,Ltd	SUN A KAKEN Co.,Ltd.				
	FUJIMORI KOGYO CO., LTD.				
Optimax Technology	LINTEC Corporation				
	SUN A KAKEN Co., Ltd.				
	NITTO DENKO CORPORATION				
LG Chem	FUJIMORI KOGYO CO., LTD.				
	Teijin DuPont Films Japan Limited				
Cheil Industries (former ACE DIGITECH)	In-house				
	SUN A KAKEN Co., Ltd.				
	FUJIMORI KOGYO CO., LTD.				
BenQ Materials Corp. (former DAXON)	OSUNG LST Co., Ltd.				
	Youl Chon Chemical, Ltd.				
CMMT (Chi Mei Materials Technology)	FUJIMORI KOGYO CO., LTD.			60%	
	SUN A KAKEN Co., Ltd.			-	
	NITTO DENKO CORPORATION		10%	40%	
Winda Opto-Electronic	FUJIMORI KOGYO CO., LTD.		80%	80%	
	SUN A KAKEN Co., Ltd.		20%	20%	
SHENZHEN SUNNYPOL OPTOELECTRONICS	FUJIMORI KOGYO CO., LTD.	Partial	100%	100%	
	OSUNG LST Co., Ltd.	-	-	Partial	
Wenzhou Qiaoye Economy Development Co., Ltd	SUN A KAKEN Co., Ltd.	Partial	100%	100%	



1-5-5. Shares of Release Film Manufacturers at Leading Polarizer Manufacturers

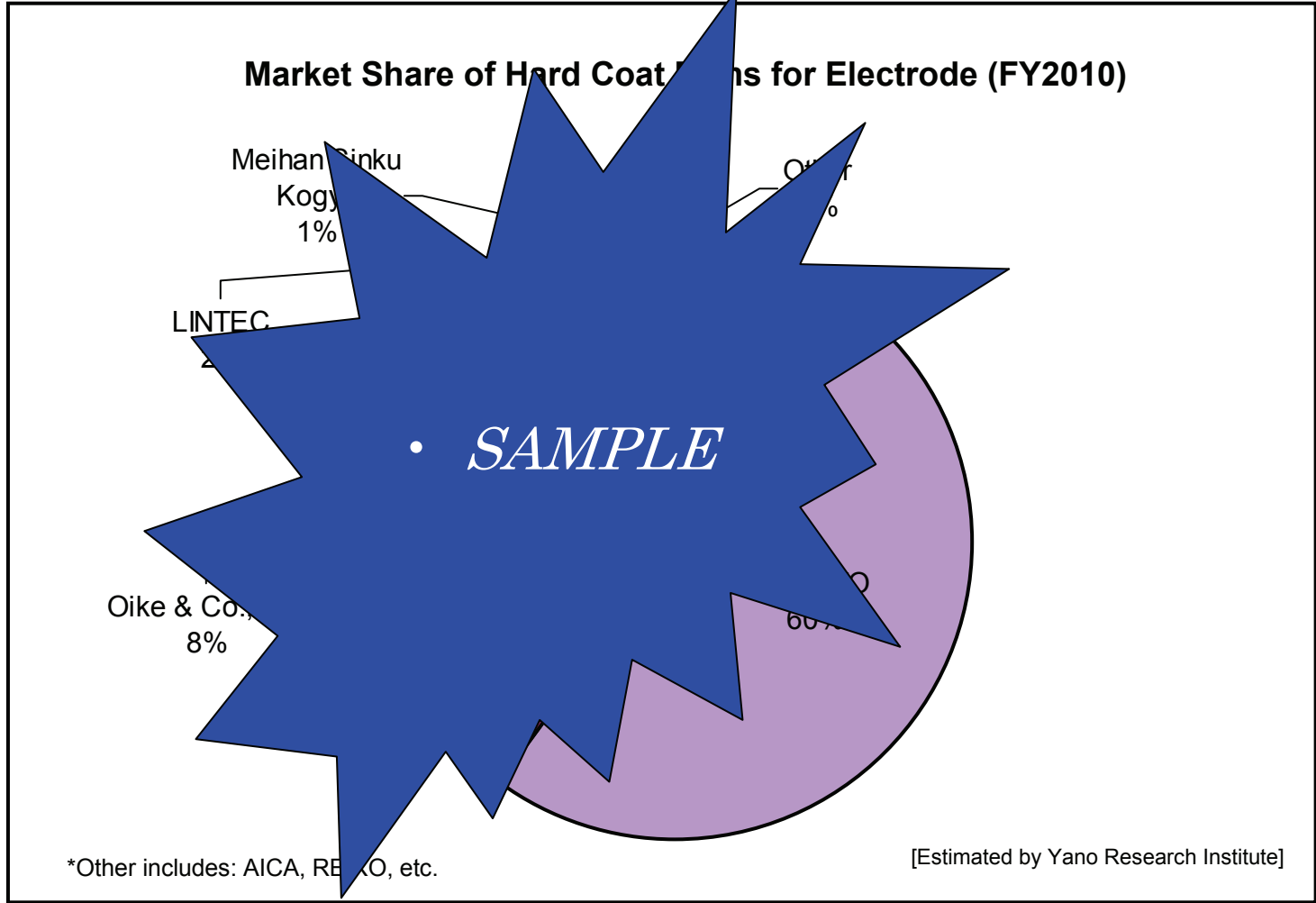
	Manufacturers	FY2008	FY2009	FY2010	FY2011 (estimate)
NITTO DENKO CORPORATION	MITSUBISHI PLASTICS, Inc.	70%	70%	70%	70%
	Toray Industries, Inc.	30%	30%	30%	30%
Sumitomo Chemical Co., Ltd	LINTEC Corporation	100%	100%	100%	100%
SANRITZ CORPORATION	Teijin DuPont Films Japan Limited	80%	Partial	-	-
	MITSUBISHI PLASTICS, Inc.	20%	-	100%	100%
Polatechno Co.,Ltd	LINTEC Corporation	90%	-	-	-
	Teijin DuPont Films Japan Limited	-	-	-	-
Optimax Technology CO.	Teijin DuPont Films Japan Limited	70%	-	-	-
	MITSUBISHI PLASTICS, Inc.	30%	-	-	-
	Nan Ya Plastics Corporation	-	-	20%	20%
LG Chem	MITSUBISHI PLASTICS, Inc.	-	-	50%	50%
	Toray Advanced Materials Korea, Inc.	-	-	50%	50%
ACE DIGITECH (Cheil Industries)	MITSUBISHI PLASTICS, Inc.	20%	-	-	-
	Toray Advanced Materials Korea, Inc.	-	-	100%	100%
DAXON (BenQ Materials)	MITSUBISHI PLASTICS, Inc.	100%	100%	100%	100%
CMMT	MITSUBISHI PLASTICS, Inc.	80%	80%	100%	100%
	Toray Industries, Inc.	20%	20%	-	-



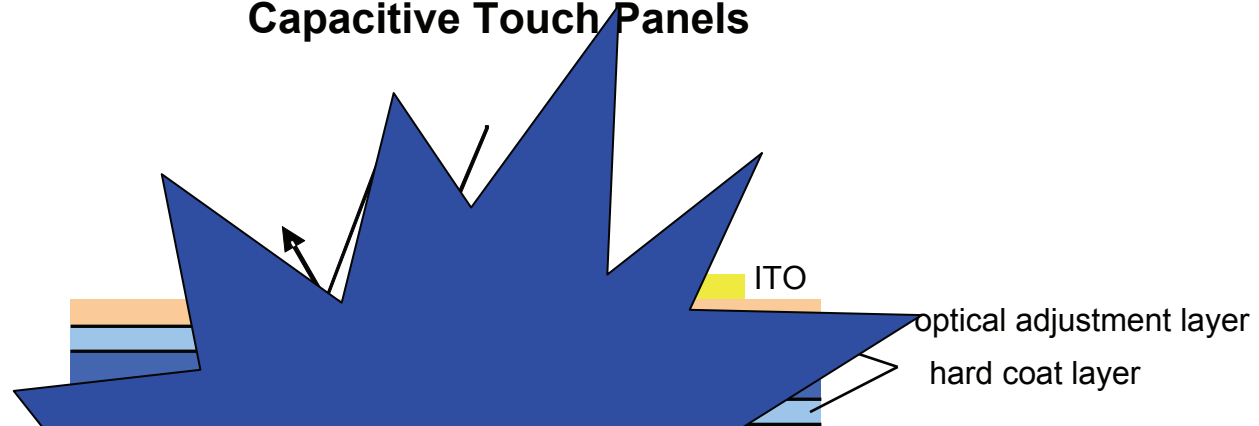
* Toray Advanced Materials Korea, Inc. was renamed from Toray Saehan Inc. in April 2010.

[Estimated by Yano Research Institute]

**KIMOTO Leads With the Utmost High Share;
TEIJIN and Oike Manufacture within Group**



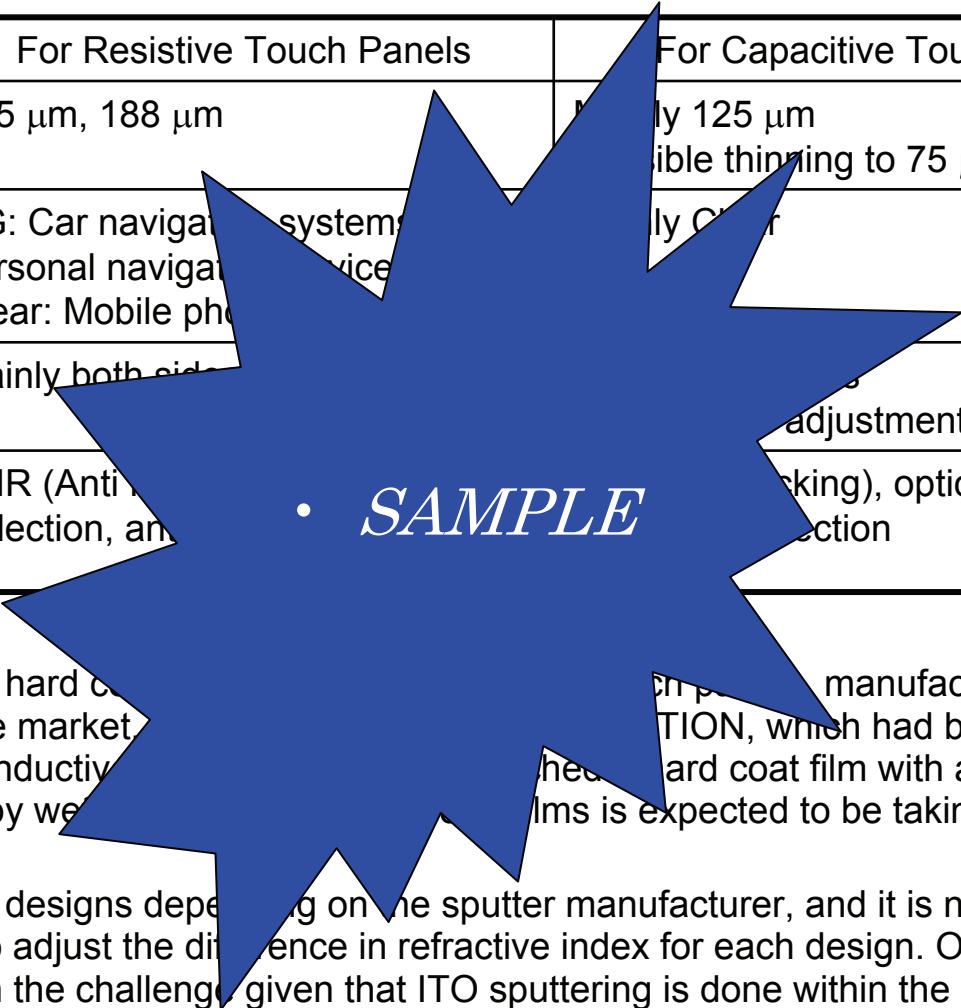
Need for Hard Coat Film That Makes the ITO Pattern Less Visible in Capacitive Touch Panels



• *SAMPLE*

- In a capacitive touch panel, the ITO pattern becomes more visible due to the difference in refractive index between the ITO and the hard coat layers. To resolve this, manufacturers form an optical adjustment layer on the surface of the base film so that it matches the refractive index on the surface of the ITO before applying the ITO sputtering procedure.
- However, it is not easy to make the ITO pattern less visible without affecting the transparency level. Other than NIPPO DENKO, only limited manufacturers including Oike & Co. and Sekisui Nano Co. Technology are capable of supplying ITO films for capacitive touch panels.
- Although performing the optical adjustment based on dry coating is said to achieve a higher effect, using wet coating instead enables the manufacturer to reduce costs.

	For Resistive Touch Panels	For Capacitive Touch Panels
Thickness	125 μm , 188 μm	Mainly 125 μm Possible thinning to 75 μm and 50 μm
Type	AG: Car navigation systems, personal navigation devices Clear: Mobile phone displays	Mainly Clear
Hard coat layer	Mainly both sides	Mainly one side Optical adjustment layer
Examples of desired functions	ANR (Anti-reflection), reflection, anti-glare	AR (Anti-reflection), AR (Anti-reflection), optical adjustment layer, reflection



- With the expansion of the hard coat film market, hard coat film manufacturers with new strategies are entering the market. These manufacturers are developing hard coat films with antireflective films and conductive films. The hard coat film with an optical adjustment layer formed by wet coating is expected to be taking a similar approach.
- ITO films come in varying designs depending on the sputter manufacturer, and it is not easy for hard coat film manufacturers to adjust the difference in refractive index for each design. Oike Fine Coating, Inc. is actively coping with the challenge given that ITO sputtering is done within the Oike Group, and Higashiyama Film Co. Ltd. which has built close relationships with ITO sputter manufacturers, has been successful, reportedly. With the exception of these two firms, manufacturers in general have either only recently entered the market or are in process of research and development.

3-1. Ratio of Optical Applications in Sales Volume of PET Films

Ratio of Optical Applications in Sales Volume of PET Films
(Leading Four Domestic Suppliers)

(Unit: share on lower line)

	2009		2010		2011 (estimate)		2012 (forecast)	
	Value	Share (%)	Value	Yr/yr (%)	Value	Yr/yr (%)	Value	Yr/yr (%)
FPD optical applications	84,600	(40.6%)	103,800	122.7%	118,100	113.7%	142,300	113.7%
Non-optical applications	123,600	(59.4%)	230,000	122.1%	61,400	28.5%	57,000	-7.1%
Total industrial applications	208,200	(100.0%)	233,800	112.3%	179,500	76.8%	199,300	110.5%

* Leading four domestic suppliers include Toyobo, Toray, Teijin, and TOYOBO. Figures include exports.

Ratio of Optical Applications in Sales Volume of PET Films
(Leading Three Korean Suppliers)

(Unit: ton; share on lower line)

	2009		2010		2011 (estimate)		2012 (forecast)	
	Value	Share (%)	Value	Yr/yr (%)	Value	Yr/yr (%)	Value	Yr/yr (%)
FPD optical applications	60,900	(30.3%)	110,000	180.6%	151,500	137.7%	169,500	119.8%
Non-optical applications	140,100	(69.7%)	223,800	159.7%	145,000	64.9%	159,500	110.0%
Total industrial applications	201,000	(100.0%)	333,800	166.1%	296,500	88.8%	329,000	114.8%

* Leading three Korean suppliers include LG, Samsung, and Toray. Figures include exports.

Ratio of Optical Applications in Sales Volume of PET Films

(Unit: share on lower line)

	2009		2010		2011 (estimate)		2012 (forecast)	
	Value	Share (%)	Value	Yr/yr (%)	Value	Yr/yr (%)	Value	Yr/yr (%)
FPD optical applications	84,600	(40.6%)	103,800	122.7%	118,100	113.7%	142,300	113.7%
Non-optical applications	123,600	(59.4%)	230,000	122.1%	61,400	28.5%	57,000	-7.1%
Total industrial applications	208,200	(100.0%)	233,800	112.3%	179,500	76.8%	199,300	110.5%

* Two Taiwan suppliers include Toray and Teijin. Figures include exports.

Ratio of Optical Applications in Sales Volume of PET Films

(Unit: ton; share on lower line)

	2009		2010		2011 (estimate)		2012 (forecast)	
	Value	Share (%)	Value	Yr/yr (%)	Value	Yr/yr (%)	Value	Yr/yr (%)
FPD optical applications	60,900	(30.3%)	110,000	180.6%	151,500	137.7%	169,500	119.8%
Non-optical applications	140,100	(69.7%)	223,800	159.7%	145,000	64.9%	159,500	110.0%
Total industrial applications	201,000	(100.0%)	333,800	166.1%	296,500	88.8%	329,000	114.8%

* Two Taiwan suppliers include Toray and Teijin. Figures include exports.

- Foreign manufacturers began to secure a fair amount of shares on the optical-grade PET film market in 2005.
- Leading Korean and Taiwanese LCD panel manufacturers used to procure optical-grade PET films as components and materials of LCD panels primarily from Japan.
- It was around 2005 that Korea, the home of the world's two largest panel manufacturers Samsung and LG, began to promote the "Buy Korean" trend, almost as a state policy, of purchasing Korean-made components and materials. Furthermore, in Taiwan where companies until recently depended on Japan for optical components and materials, leading panel manufacturers such as AUO, CIC, CPT and Hannstar Display have been increasingly active in procuring domestic components and materials.
- Foreign panel manufacturers have requested PET film manufacturers in their respective countries to develop optical-grade materials. Since around 2008, foreign PET film manufacturers began full-fledged development and provision of optical-grade products to replace imports from Japan.

3-2. Sales Volumes of Leading Manufacturers of PET Films for Optical Applications

(Unit: ton; share on lower line)

		2009	2010		2011 (estimate)		2012 (forecast)	
				Yr/yr		Yr/yr		Yr/yr
Japanese Manufacturers	MITSUBISHI PLASTICS, Inc.	39,200 (26.1%)	53,300 (23.0%)	136.0%	56,300 (21.1%)	105.0%	59,100 (18.6%)	105.0%
	Toray Industries, Inc.	18,900 (12.6%)	21,100 (9.1%)	111.6%	21,000 (8.0%)	100.0%	25,000 (7.7%)	116.8%
	Teijin DuPont Films Japan Limited	16,100 (10.7%)	18,800 (8.1%)	116.8%	18,800 (7.2%)	100.0%	20,000 (6.3%)	139.2%
	TOYOBO CO.,LTD	10,400 (6.9%)	10,600 (4.6%)	101.9%	10,600 (4.1%)	100.0%	10,600 (3.3%)	100.0%
Sub-total		84,600 (56.4%)	103,800 (44.8%)	122.7%	106,700 (41.4%)	105.0%	119,700 (37.0%)	113.2%
Korean Manufacturers	SKC	28,900 (19.3%)	37,000 (15.9%)	128.0%	37,000 (14.2%)	100.0%	41,000 (12.7%)	110.6%
	Toray Advanced Materials Korea, Inc.	16,000 (10.7%)	37,000 (15.9%)	231.3%	37,000 (14.2%)	100.0%	45,000 (13.9%)	121.6%
	KOLON	16,000 (10.7%)	41,000 (17.6%)	256.3%	41,000 (15.8%)	100.0%	50,000 (15.3%)	129.3%
Sub-total		60,900 (40.6%)	115,000 (49.4%)	188.8%	115,000 (44.4%)	100.0%	136,000 (41.9%)	119.8%
Taiwanese Manufacturers	Nan Ya	4,400 (2.9%)	11,800 (5.1%)	268.2%	11,800 (4.5%)	100.0%	21,000 (6.6%)	120.7%
	Shinkong Materials Technology Co., Ltd.	100 (0.1%)	1,500 (0.7%)	1400.0%	1,500 (0.6%)	100.0%	9,600 (3.0%)	266.7%
Sub-total		4,500 (3.0%)	13,300 (5.7%)	295.6%	13,300 (5.1%)	100.0%	30,600 (9.6%)	145.7%
Total		150,000 (100.0%)	232,100 (100.0%)	154.7%	232,800 (100.0%)	115.0%	318,200 (100.0%)	119.3%

Note 1: Figures include exports by each supplier.

Note 2: Sum of PET films for optical applications and subsidiary materials (e.g. release films and protect films) for optical applications.

[Estimated by Yano Research Institute]

HIGH-PERFORMANCE FILM MARKET 2011

Price 200,000JPY (5% consumption tax (or 10,000JPY) added for shipment within Japan)

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Researched by CMEO Division, Chemicals & Materials / Electronics & Optics
Phone: +81-3-5371-6930
Facsimile: +81-3-5371-6975
<http://www.yanoresearch.com/>

Tokyo HQ: Nakano Sakaue Central Bldg., 2-46-2 Honcho, Nakano-ku, Tokyo 164-8620, Japan
Osaka Office: 1-8-6 Azuchimachi, Chuo-ku, Osaka 542-0052, Japan Phone: +81-6-6266-1381
Nagoya Office: 2-3 Shin-Sakaemachi, Naka-ku, Nagoya, Aichi 460-0044, Japan Phone: +81-52-962-2461
Fukuoka Office: 2-6-23 Hakataeki-higashi, hakata-ku, Fukuoka Phone: +81-92-482-1088
Seoul Office: 1206 Leema Bldg., Susong-dong-Chongro-ku, Seoul, 110-755, Korea Phone: +81-2-735-2280
Shanghai Office: Westgate Tower Room 1609A, 1038 Nanjing Xi Lu, Shanghai, 200041, China
Phone: +86-21-6218-1805
Taipei Office: 11F, No. 156, Sec. 3, Minsheng E. Rd., Songshan District, Taipei 105, Taiwan
Phone: +886-936172881