

# 전자재료용 기능성 화학 소재 개발

2008년 10월 24일(금)

미원상사(주) 연구소  
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## 목차

- 미원상사 소개
- **FPD (Flat Panel Display)의 구조**
  - LCD (Liquid Crystal Display)의 구조
  - PDP (Plasma Display Panel)의 구조
  - OLED (Organic Light Emitting Diode)의 구조
- **FPD에 사용되는 화학소재**
- **FPD용 화학소재의 현황 및 개발 방향**

## Miwon Commercial Co., Ltd



### □ OUR VISION

TO BECOME A MANUFACTURER AND  
SUPPLIER OF THE WORLD BEST  
CHEMICALS FOR THE CUSTOMERS



### □ CORPORATION

CONCENTRATED ONLY IN CHEMICAL INDUSTRY  
SINCE ITS ESTABLISHMENT IN 1959  
AND PUBLIC LISTED AT KOREA STOCK  
EXCHANGE MARKET IN 1989



## OUR BUSINESSES

-PERFORMANCE CHEMICALS

-PERSONAL CARE INGREDIENTS

-SPECIALTY CHEMICALS

-ELECTRONIC CHEMICALS

-POLYMER ADDITIVES



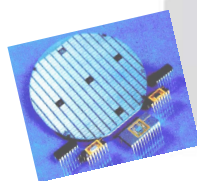
## SPECIALTY CHEMICALS BU

- PHOTOINITIATORS: BDK , CP-4, HP-8, MS-7, BMS, TPO, EHA, EPD, ITX, CTX, BP, MBP, MBB, MBF, PBZ
- FUNTIONAL MONOMERS: (Meth)acrylate Monomers Monomers
- OLIGOMERS: Epoxy Acrylate, Urethane Acrylate, Polyester Acrylate, Special Acrylates
- EPOXY DILUENTS: Glycidyl Ether
- OTHERS: Sucrose Benzoate, Benzoin

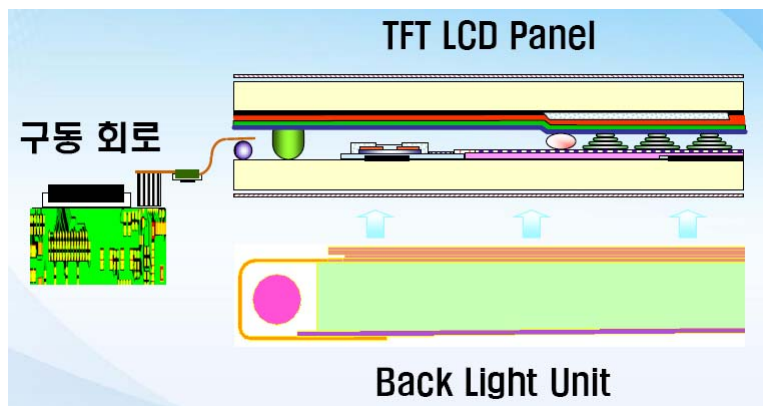


## ELECTRONIC CHEMICALS BU

- PHOTSENSITIZERS for G-Line, I-Line, LCD PhotoResist
- PHOTOCROSSLINKING AGENT for CRT PhotoResist
- PS & PHOTORESIST for PS Plate
- PS & PHOTOPOLYMER for Silk Screen Prints
- BINDER RESINS for LCD & PDP

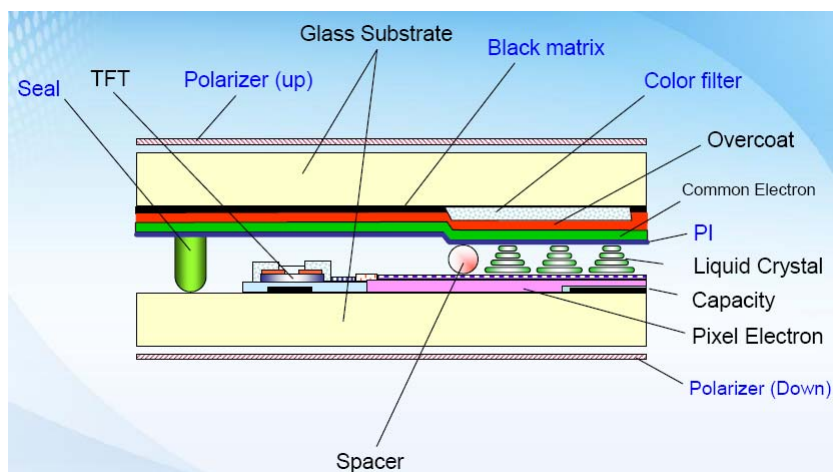


## TFT-LCD Module Structure



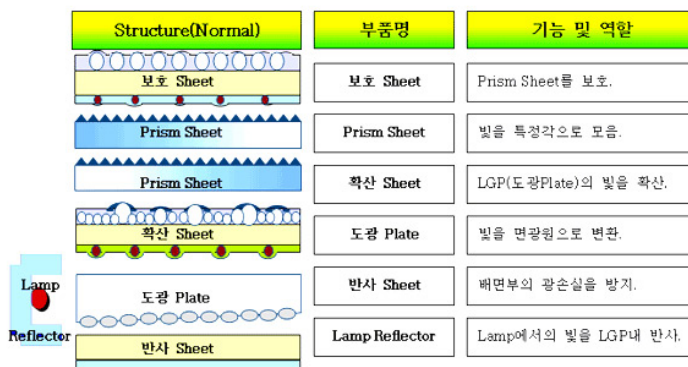
출처: 2008 고분자 포럼 - 고분자소재부품 기술의 선진화

## TFT-LCD Panel Structure



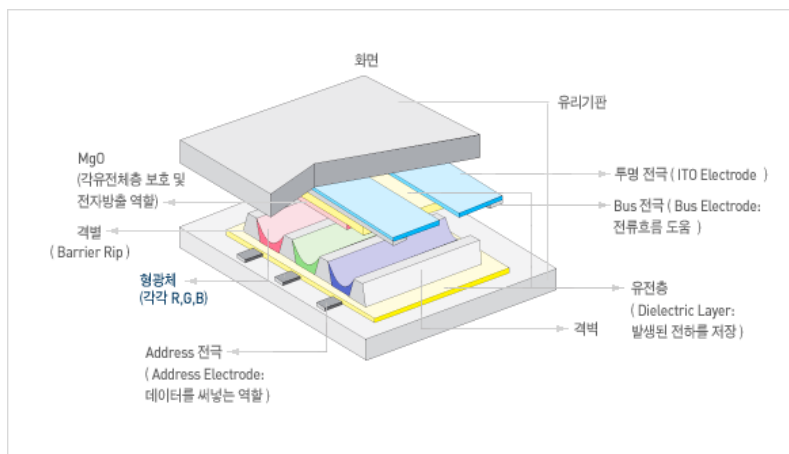
출처: 2008 고분자 포럼 - 고분자소재부품 기술의 선진화

## Back Light Unit (BLU) Structure



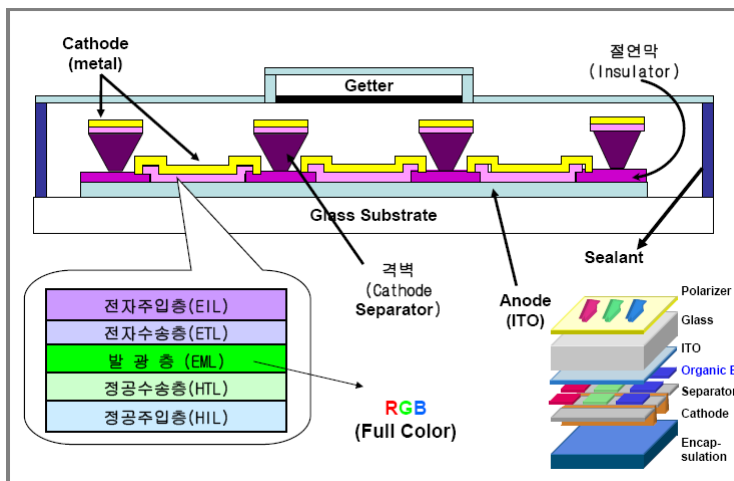
출처: <http://www.sk.c.co.kr/>

## PDP Panel Structure



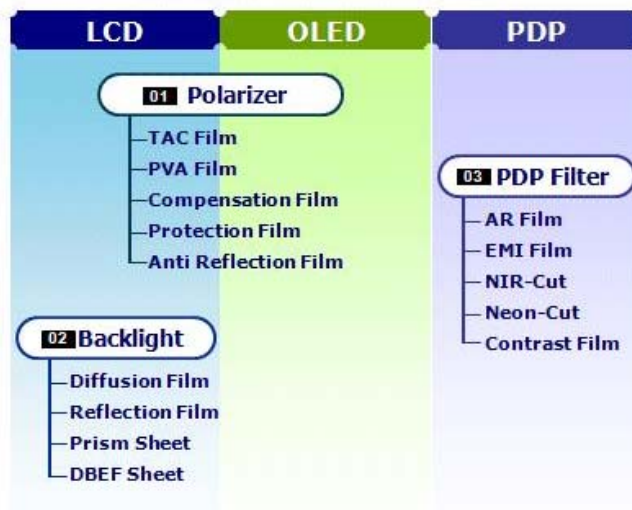
출처: <http://www.samsungsdi.co.kr>

## OLED Panel Structure



출처: 2006 FPD 전문가 양성 세미나 - OLED 구조 및 구동원리

## Optical Films for FPD



출처 : 디스플레이뱅크

## Optical Film for FPD

Display type	Module	Film	Base film	
LCD	편광판	반사방지 필름 (AG / AR / LR)	PET, TAC	
		Polarizer	편광필름	PVA
			편광판 보호필름	TAC
			이형 필름	PET
			1/4 λ Plate	PC, COC
		보호필름	PE	
	보상필름	필름 연신형	PC, COC, 연신 TAC	
			액정 코팅형	WV, LC 필름
	BLU	휘도향상 필름	프리즘 쉬트 (BEF)	PET
			DBEF(적층형)	PEN 계
DRPF			PEN 계	
확산 필름			PET, PC	
		반사 필름	PET 계	
PDP	PDP filter	AR Layer	PET	
		NIR-Cut Layer	PET	
		Color compensation Layer	PET	
OLED	Polarizer (10배)			

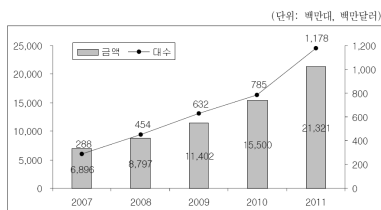
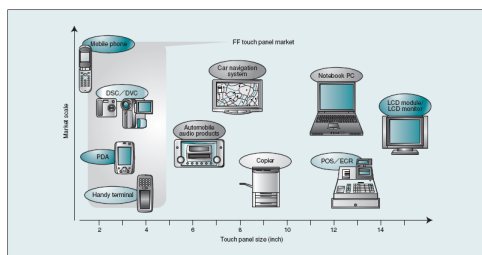
출처 : 엑스포렘 컨퍼런스 2005 프로그램 II

## 편광필름 주요 코팅 - 반사 방지 기능

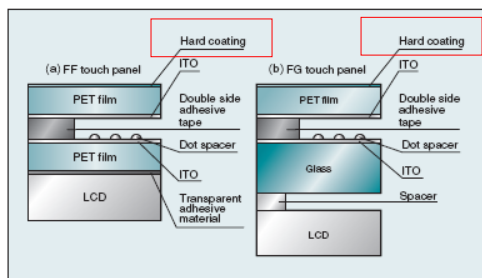
필름 이름	AG 코팅	AR 코팅	LR 코팅
정식명칭	Anti Glare 코팅	Anti Reflection 코팅	Low Reflection 코팅
반사율	3%이상도 허용	1% 미만	1%~3% 수준
역할	눈부심 방지	반사방지	반사방지
구현	표면을 거칠게 코팅함으로 입사된 빛을 난반사 시킴	특수재질 코팅막에서 입사된 빛 대부분 흡수	특수재질 코팅막에서 입사된 빛 상당부분 흡수하고 일부 반사
비고	AG 코팅 아래에 AR/LR을 동시에 적용가능, AG/AR 및 AG/LR과 같은 조합으로 적용함		
구조			

출처 : LCD 부품(2), 미래에셋증권

## Touch panel – ITO film



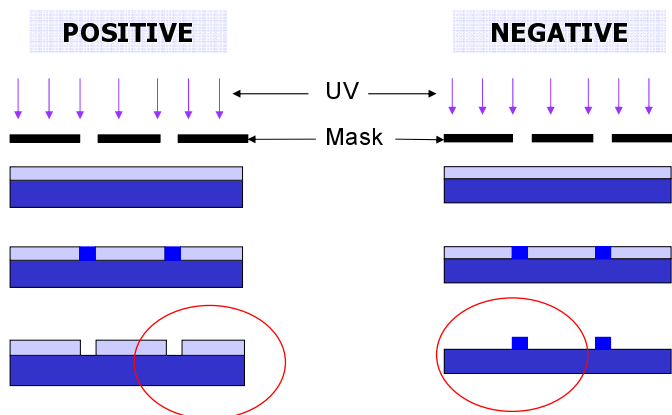
자료: 디스플레이뱅크, 2008



UV curable monomer, oligomer, binder

출처: FIND, 22(2) 2004

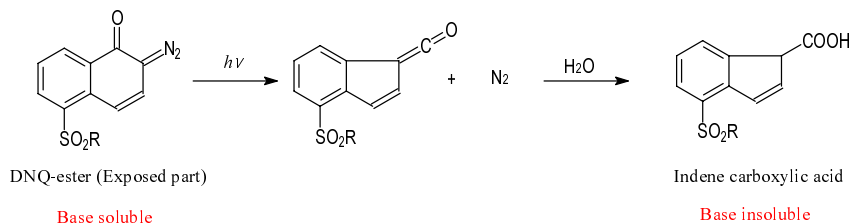
## Positive system and Negative system



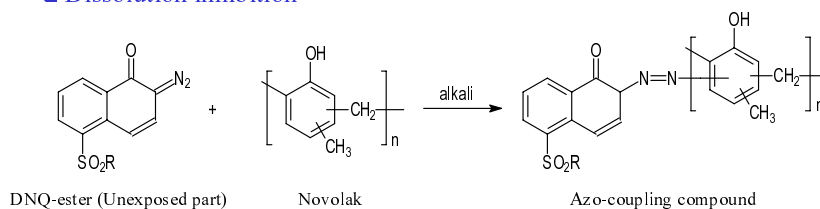


## Photo Active Compound (PAC)

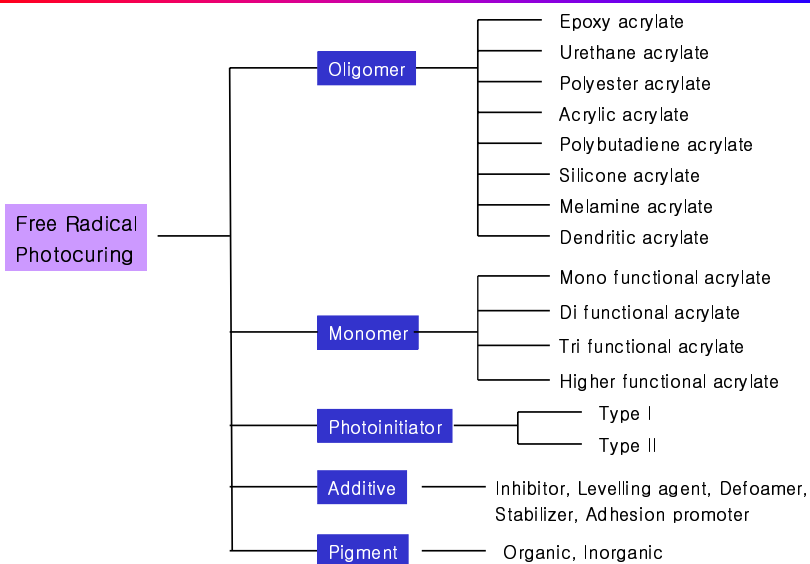
### □ Dissolution promotion



### □ Dissolution inhibition



## Components of UV curing system



## Role of photo-curing materials

### □ Photoinitiators

빛을 흡수하여 라디칼을 생성한 후 개시를 하게 되는 역할

### □ Acrylated Oligomers

경화 필름 특성 대부분을 좌우하는 역할

### □ Acrylated Monomers

반응성 희석제 또는 가교제로서의 역할

경화 필름의 접착력, 유리전이온도, 기계적물성에 영향을 미침

### □ Additives

Inhibitor : 중합 금지 역할

Levelling agent : 표면을 균일하게 하는 역할

Defoamer : 기포를 억제하는 역할

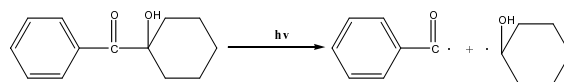
Adhesion promoter : 접착 증진 역할

### □ Pigments (if necessary)

## Photo-initiator

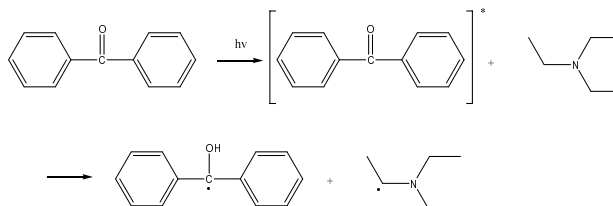
### □ Type I (Uni-molecular Reaction Type)

Absorbed light energy is the cause of  $\alpha$ -cleavage, which generates radicals

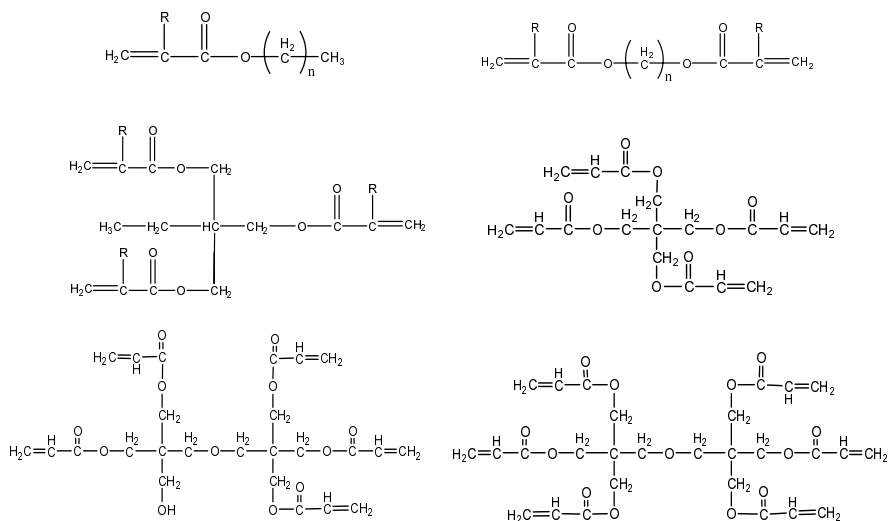


### □ Type II (Bi-molecular Reaction Type)

Light energy is absorbed by one material and the energy is transferred to a second material which generates radicals



## Photo curable materials; Monomers

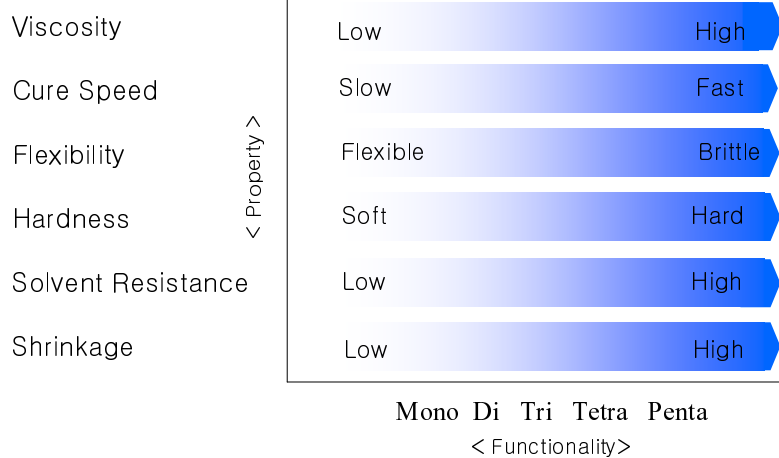


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21p

## Photo curable materials; Monomers

Effect of monomer functionality



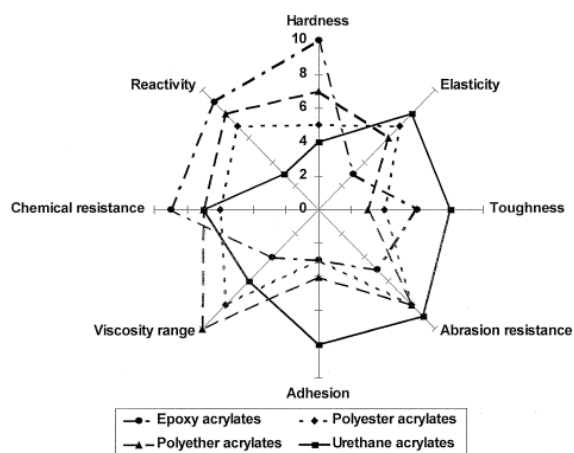
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## Photo curable materials; Oligomers

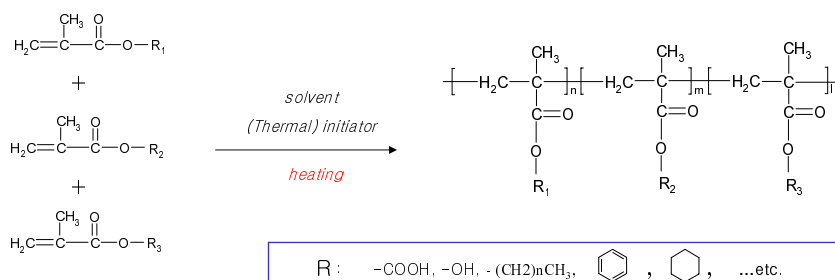
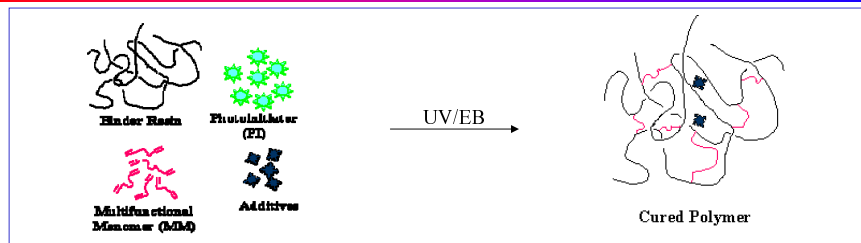
- ❑ Epoxy Acrylates
- ❑ Urethane Acrylates
- ❑ Polyester Acrylates
- ❑ Acid Pendant Epoxy Acrylates
- ❑ Chlorinated Polyester Acrylates
- ❑ Full Acrylic Acrylates
- ❑ Waterborne Aliphatic Urethane Diacrylate Oligomers
- ❑ Water Soluble Acrylate Oligomers
- ❑ Dendritic (Hyperbranched) Acrylates

## Comparison of coating properties by oligomer classes



*Macromol. Symp.* 159, 197–204 (2000)

## The function of binder polymer



## FPD용 화학소재의 현황 및 개발방향

- 소량 다품종 맞춤형 재료 요구 - 일관성(Consistency)가 매우 중요
- 특수 기능성(극한 물성) 재료 요구
  - (초)고굴절, (초)저굴절, 고경도, 고탄성, 저수축, 저황변, 대전방지, 내습성, 속경화, 후경화
- 전자재료 업체간의 수직 계열화
- 관련 시장의 통합화 및 유기화 - 한국/일본/대만/중국
- 치열한 가격경쟁 - 원가 상승과 지속적인 판가하락
- 특허분쟁 증가 - 물질특허, 제법특허, 용도특허
- 신규 화학물질 등록 - 불확실한 시장상황 vs 등록비용
- 한국의 재료 업체 - 높은 진입 장벽 vs 무한한 기회