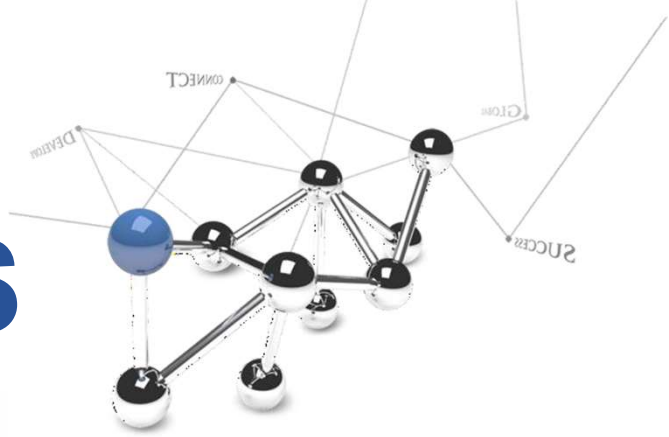
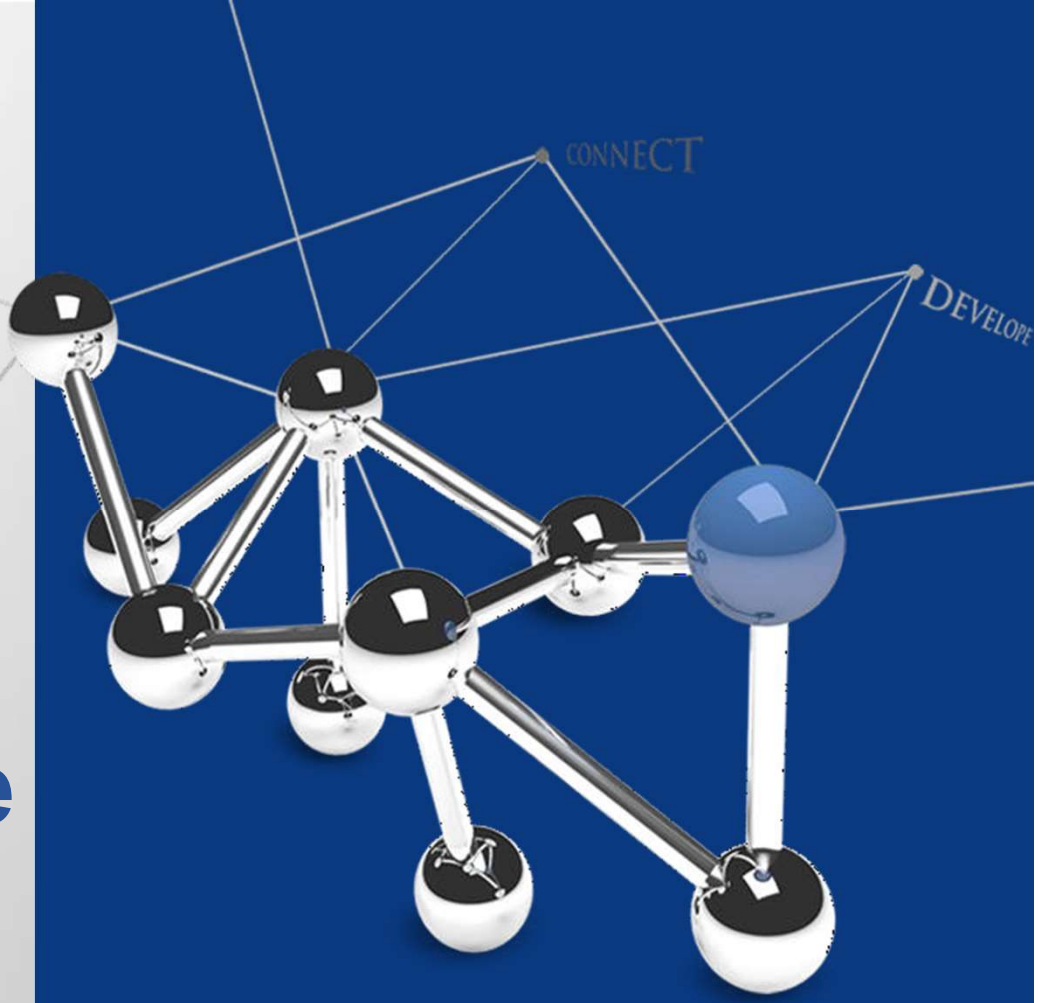
YUJIN CHEMICAL

Mobile of Adhesive for Camera Module

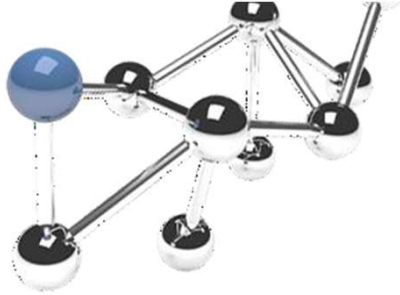
CONTENTS



01. About Adhesive



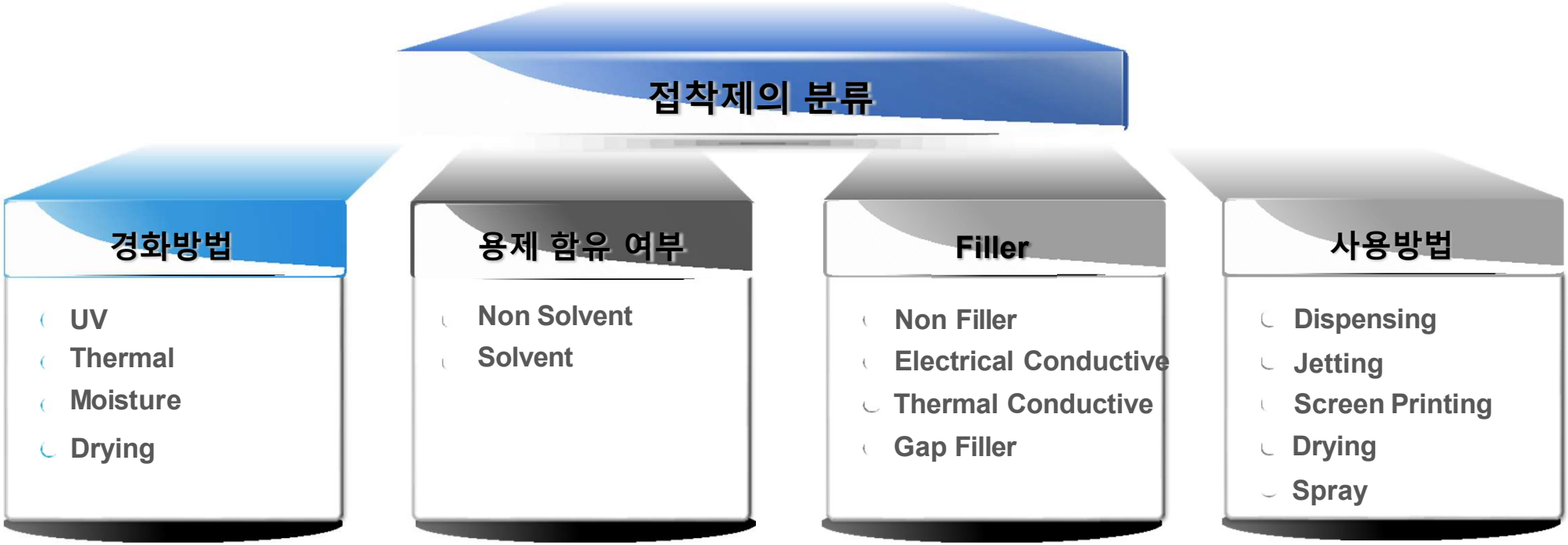
1.About Adhesive



물질과 물질간의 물리적 또는 전기적 연결을 위한 고분자 재료

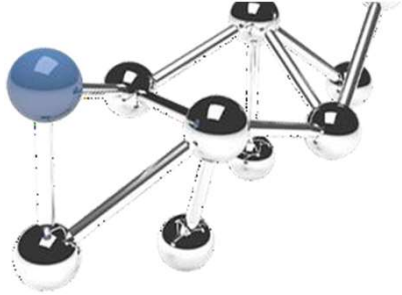
【 일반적인 특징 】

- ✓ 일반적으로 액체이며, 에너지를 받으면 고체로 변화 ⇨ "경화 반응"
- ✓ 경화 반응을 일으킬 수 있는 에너지는 열, 광, 습기, 수분 등으로 다양
- ✓ 접착제는 피착제, 사용방법, 경화방법, 경화 후 물성에 따라 매우 다양한 제품군으로 나뉨



1.About Adhesive

-.접착제에 요구되는 물성



1 작업성

1.안정된 물성으로 연속 작업 가능
2.토출 전, 후 가장 우수한 성능을 발휘하기 위한 고객 사양에 맞는 Thixo 부여

Usability

친환경 2

Eco

1.RoHS Free
2.Halogen Free

3 Cure Condition

CURE

1.Low Temp or Low light intensity
2.고객의 요구조건에 맞는 설계

가격 4

Cost

1.국산화 등 염가 원재료 개발
2.공정의 단순화
3.고객이 요구하는 가격경쟁력

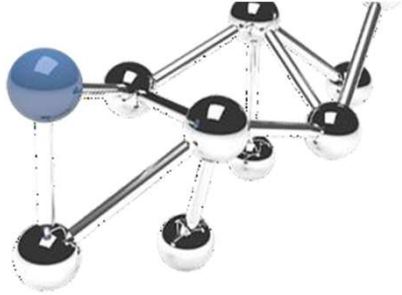
5 접착력

Adhesion

1.PC, LCP 난재질 접착능력
2.금속 + Plastic 등의 서로 다른 특성을 가진 재료의 접착능력

1.About Adhesive

-.접착제의 구성요소



ADHESIVE

Resin

Epoxy Polyurethane
Polyester Silicone
Phenoxy
PVC
Acryl Rubber

Diluent

- Solvent
- Reactive Monomer
- Non-reactive Diluent

Filler

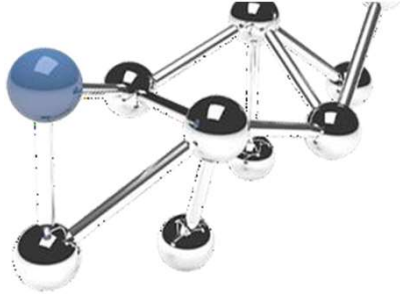
- Ag
- Ni
- Thermal Conductive
- Cu
- Al
- Au Graph
- ite Graph
- ene CNT

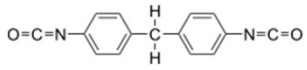
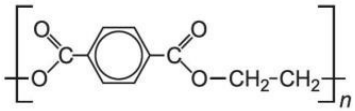
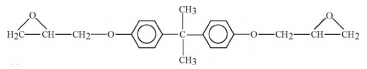
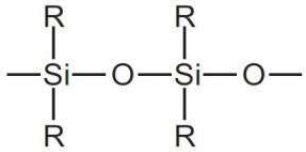
Additive

Hardner Inhibitor
Plasticizers
Settling Agent Levell ing Agent
Dispersion Agent Catal ysts Pigment

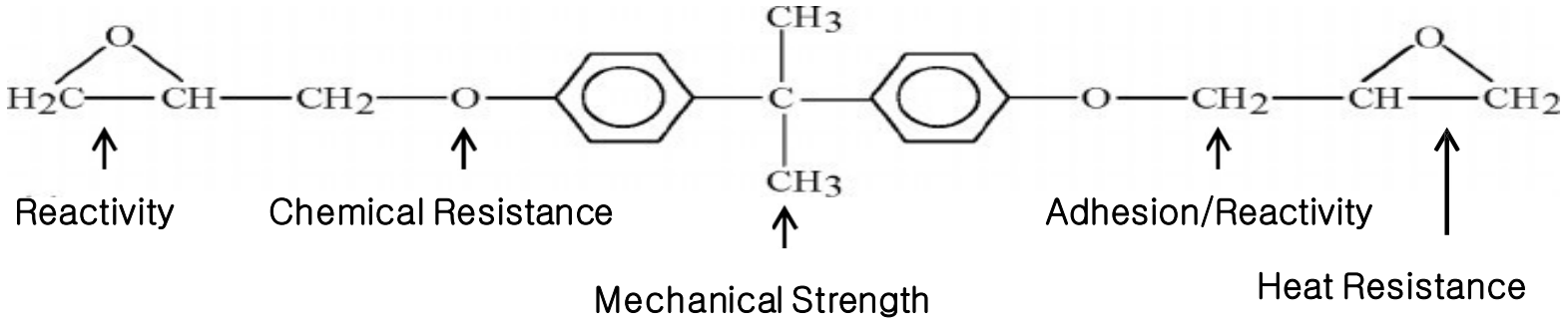
1.About Adhesive

- Adhesive Resin



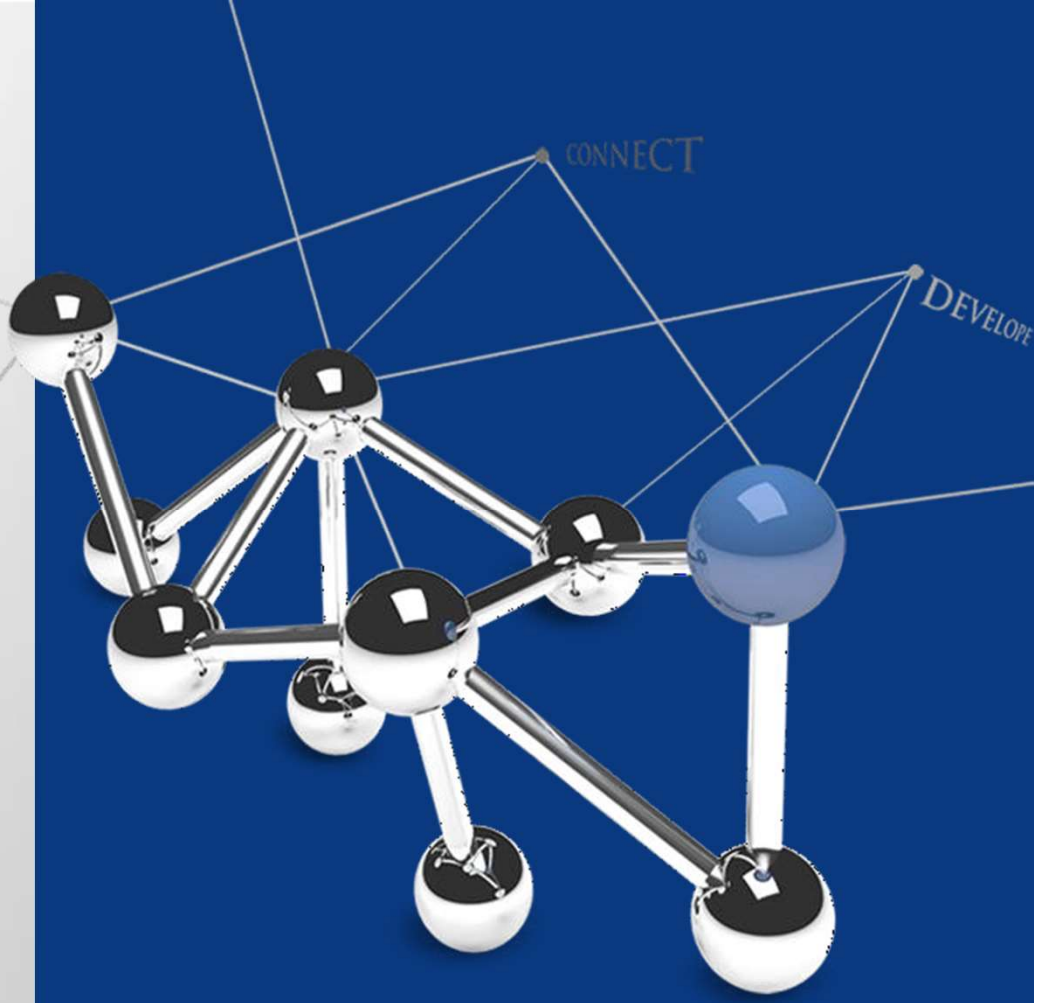
Resin Type	Polyurethane	Polyester	Epoxy	Silicone
Chemical Structure				
Characteristic	Flexibility Chemical resistance Proof resistance Yellowing by UV	Flexibility Dimensional stability Chemical resistance High mechanical strength low solubility	High adhesion high mechanical strength Dimensional stability Chemical resistance Yellowing by heat	Heat resistance Proof resistance Water resistance Bad adhesion Low hardness Bad solvent resistance

【 Epoxy Resin 】



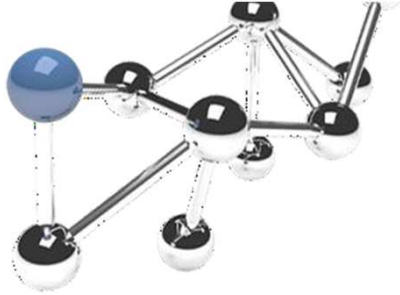
에폭시 레진의 가장 큰 장점은 경화 방법과 첨가제에 따라서 다양한 특성을 "부여"할 수 있다는 점
⇨ 흔히 단점으로 꼽히는 "황변", "비극성 Polymer에 대한 접착불량" 역시 액 배합을 통해 상당 부분 극복 가능

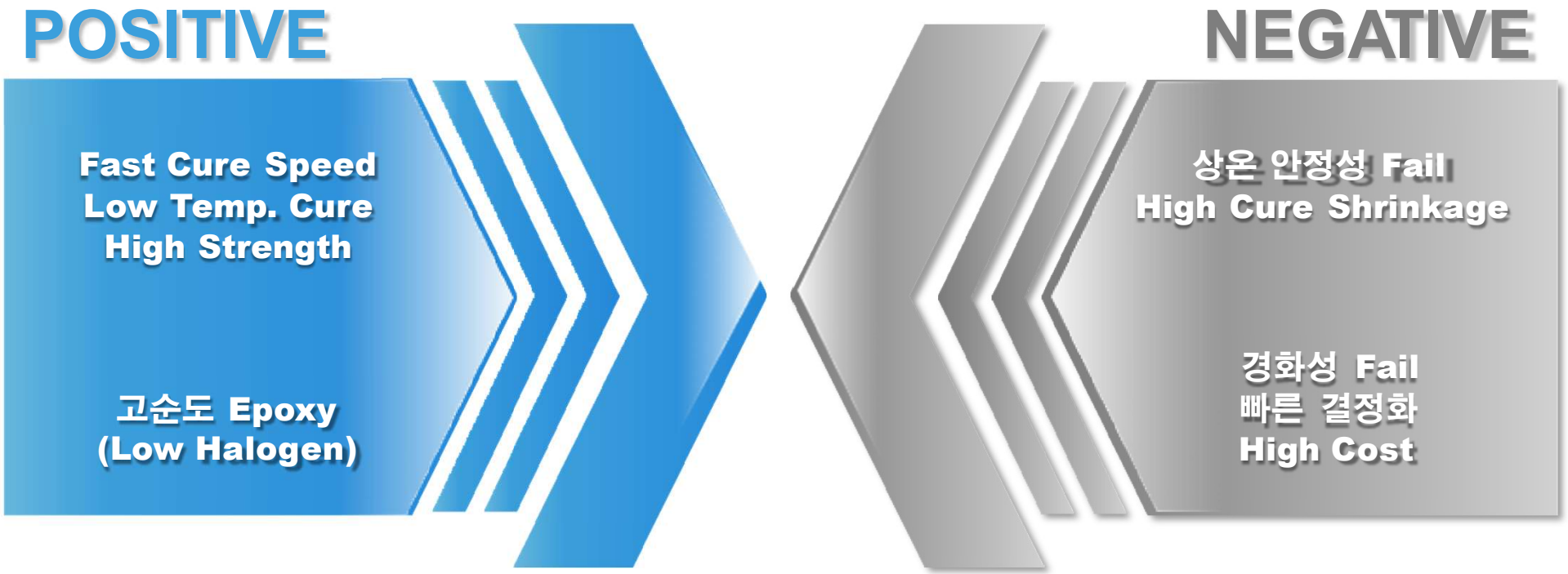
2. YUJIN Adhesive Technology



1.About Adhesive

- YUJIN CHEMICAL Adhesive Technology



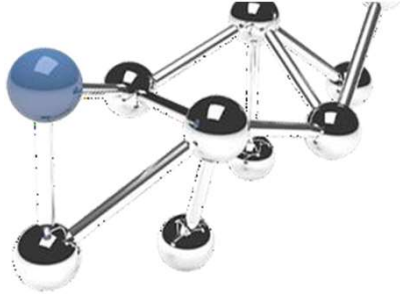


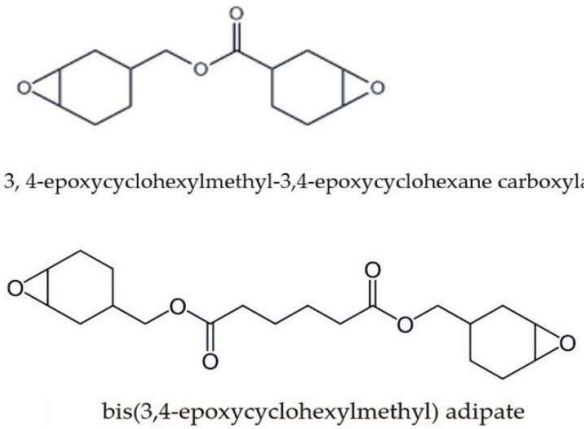
1. 낮은 수축률의 경화제를 Base로 폭발적인 반응속도를 가진 Accelerator 및 상온에서 반응을 막아주는 inhibitor를 사용하여 상온 안정성 / 높은 경화강도 / 낮은 수축률을 모두 확보

2. 결정화를 방지할 수 있도록 상호 보완적인 2종 이상의 Epoxy Resin 사용

1.About Adhesive

-YUJIN CHEMICAL Adhesive Technology
: Light Curing Mechanism

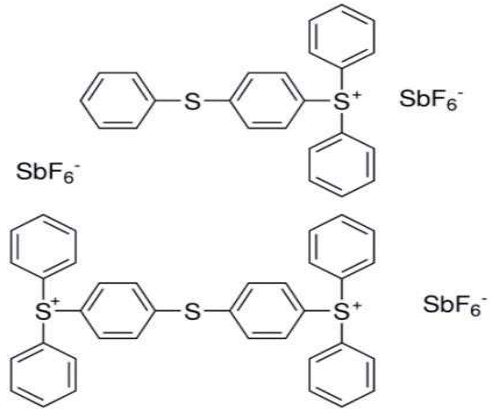




3, 4-epoxycyclohexylmethyl-3,4-epoxycyclohexane carboxylate

bis(3,4-epoxycyclohexylmethyl) adipate

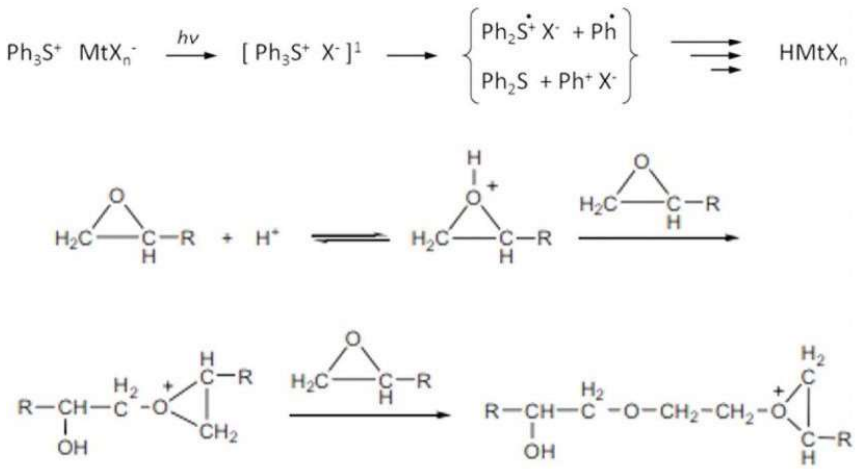
+



mixed triarylsulfonium hexafluoroantimonate salts

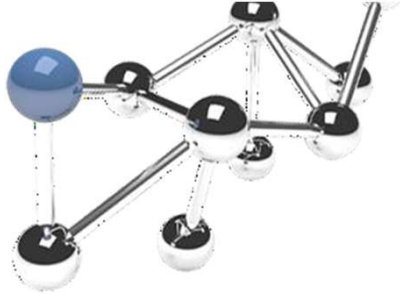
➢ 일반적인 광 개시 반응은 Radical 생성에 의한 경화반응
: 경화속도는 빠르지만, 광이 제거되면 반응이 종료되고, 최대 경화율이 낮고, 산소에 의한 경화저해를 받기 때문에 표면 Tacky 문제가 있다

➢ 유진케미칼 MAGIC LANCER series에 사용된 기술은 양이온 개시제에 의한 경화반응
: 경화속도는 상대적으로 느리지만, 반응이 종결되지 않고, 계속 Open되어 있어, Dual 경화형 레진에 적합하며, 최대 경화율이 높아서 미경화분을 최소화할 수 있는 장점



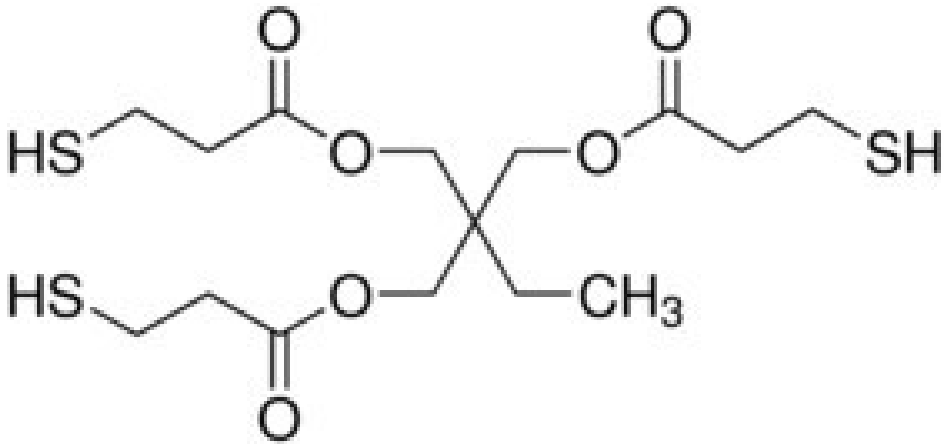
1.About Adhesive

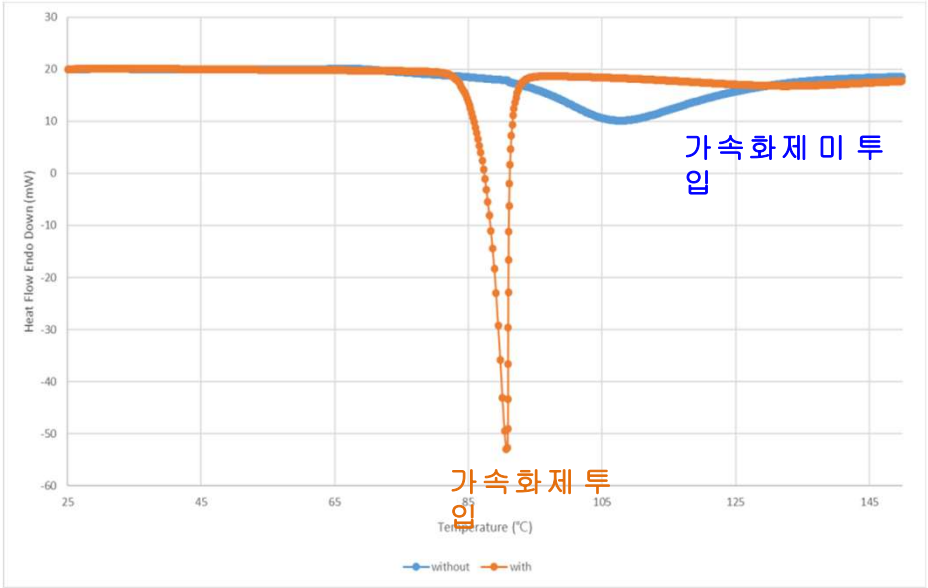
-YUJIN CHEMICAL Adhesive Technology : Thermal Curing Mechanism



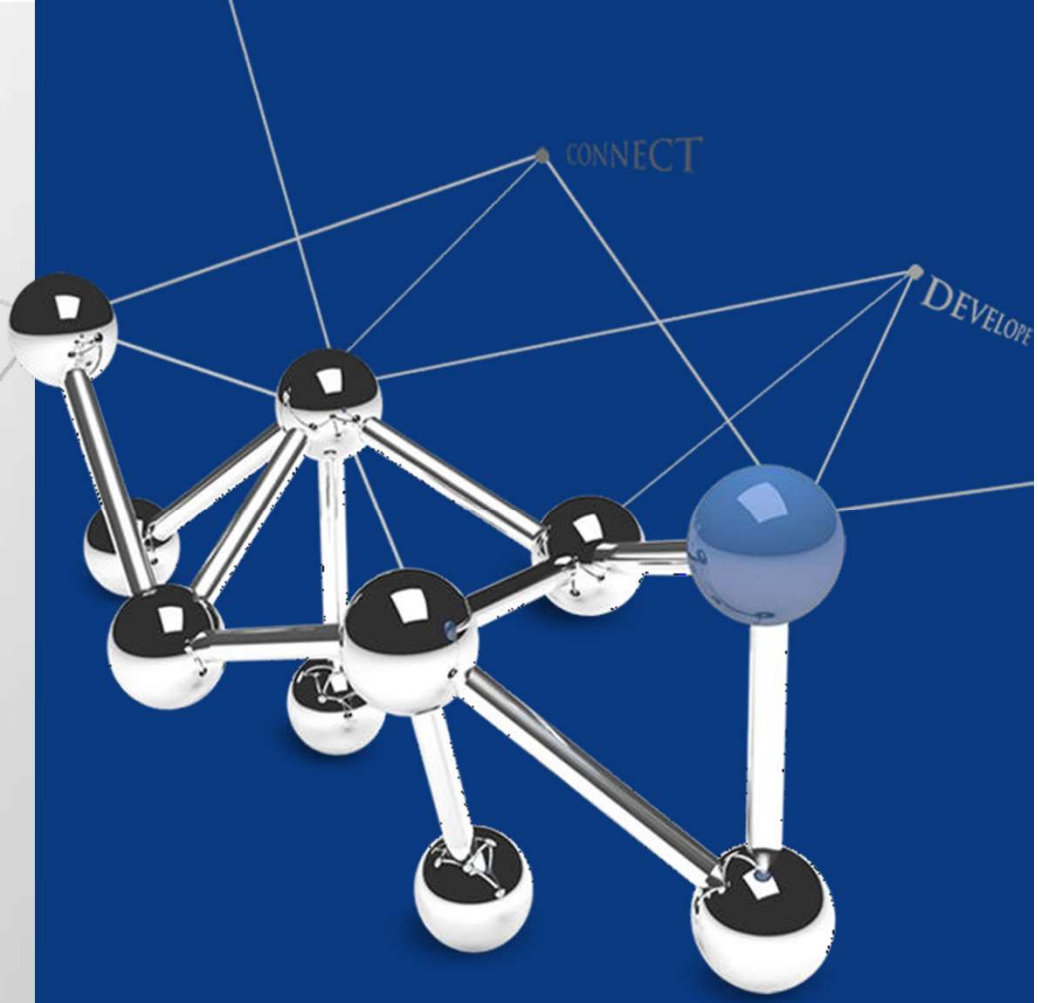
➢ **Epoxy** 경화제에 촉진 효과를 부여할 수 있는 말단기
: **-OH, -SH, -COOH, -SO_3H, -$CONH_2$, -CONHR, -SO_3NH_2, -$S0_3NHR$**
: 개시제와 촉진제를 동시에 사용하여 저온 속경화성 부여

➢ 특히, 말단에 **-SH group**을 가지고있는 촉진제를 사용하여 , 경화속도, 경화성 증가는 물론 기판과의 접착력 증대 효과



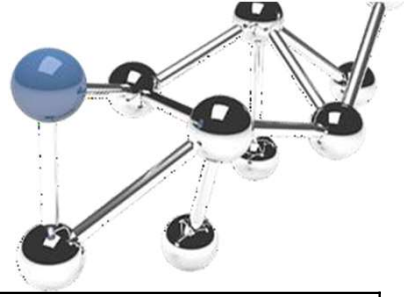


3. Introduction of YUJIN Products



1. Magic Lancer TDS

: TDS Study



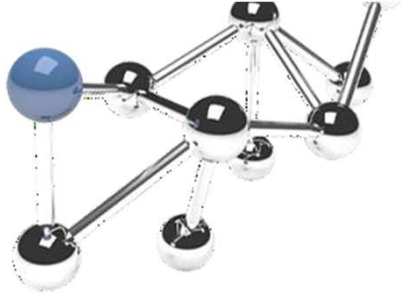
Technical data

Color	Black
Density [g/cm³] at room temperature (approx,. 25 ℃)	1.22
Viscosity [cPs] at 25 ℃, Viscometer, shear rate 8.0 1/s	50,000 ~ 60,000
Thixotropic [Index] at 25 ℃, Viscometer, shear rate 0.8 / 8.0 [s⁻¹]	5.5~6.5
Fixing time by light [s] UVA intensity: 55 – 60 mW/cm²	9~14
Curing time with air convection oven [min] At +75~80℃	40
Curing time with air convection oven [min] At +90℃	30
Curing time with air convection oven [min] At +100℃	20
Modulus [GPa] Curing: 60 min + 80 ℃	0.51
Shore hardness D Prefixing: 2 x 10s, UVA-intensity: 5500-6000 mW/cm2 Heating: 60 min at + 80 ℃	52
Glass transition temperature [℃] DMA Prefixing: 2 x 10s, UVA-intensity: 2500-3000 mW/cm2 Heating: 60 min at + 80 ℃	44

색상	눈으로 확인되는 재료의 색 및 성상 카메라 모듈에 사용되는 AA형 접착제는 흑색 혹은 반투명색이 사용된다
비중	비중계를 이용해 측정된 액체의 밀도 일반적인 액체의 비중은 1.0 ~ 1.1g/㎤ 수준
점도	접착제에 응력을 가했을 때 변형에 저항하는 정도 점도가 높다면 그만큼 변형이 일어나지 않고 본래의 형상을 잘 유지하게 되지만, 원하는 형태로 만들기 까다로워진다
TI	칙소도 접착제는 일반적으로 가해주는 힘에 따라서 점도가 달라지게 되는데, 가해주는 힘을 10배 달리하였을 때의 점도 비율을 TI(칙소도)라 한다
UV경화	접착제가 광경화되는 데 필요한 조건 Fixing 조건은 최소한의 경화조건으로, 일반적으로는 충분한 양의 광 조사를 통해 경화된다
열경화 조건	접착제가 열경화되는 데 필요한 온도와 시간 최저 경화 온도는 실험실 기준 75℃ 이며, 권장 조건은 80℃ × 40분 경화 온도가 높아질수록 보다 짧은 시간에 경화가 완료될 수 있다
모듈러스	경화된 접착제의 응력에 대한 저항력을 DMA 장비로 측정한 값 Epoxy 접착제에서는 높은 값을 나타낼수록 단단한 대신 취성 파괴될 수 있고, 낮은 값을 가진다면 말랑말랑한 대신 연성을 나타낼 수 있다
경도	Shore 법으로 측정한 경도. 경화물이 두께가 수백㎛ 정도로 두껍게 성형된다면 적절한 측정방법이며, 두께가 수 ㎛ 으로 형성된다면 Pencil Hardness 등으로 측정한다
Tg	접착제 내부의 고분자 물질이 일정 수준의 결정성을 가지게 되는 온도 Tg 이하의 온도에서는 다소 단단한 상태, Tg 이상의 온도에서는 상대적으로 무른 상태가 된다.

1. Magic Lancer TDS

: TDS Study

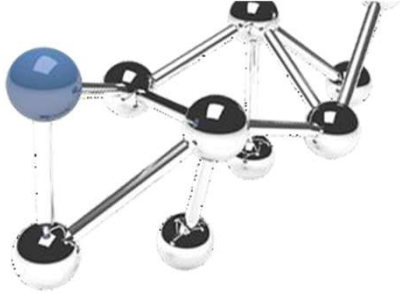


Coefficient of linear expansion [ppm.℃] TMA, In a temperature range of +25 to +40 ℃	95.1
Coefficient of linear expansion [ppm.℃] TMA, In a temperature range of +60 to +100 ℃	182.9
Shrinkage [vol. %]	<1.7
Thawing time [min] Room temperature 25 ℃	30
Work life [hr] Room temperature 25 ℃	36
Storage life at -20℃[months] Also – 40℃ to – 20 ℃ possible In unopened original container	6

열팽창계수 (CTE)	온도가 1℃ 변했을 때, 재료의 크기 변화를 ppm으로 나타낸 값 작을수록 온도에 대한 크기 변화가 적어 카메라 모듈에 적합하다 Tg를 기점으로 팽창율이 변하기 때문에, Tg 이하의 CTE / Tg 이상의 CTE로 나누어서 표기
수축률	접착제가 경화과정에서 수축하는 정도 경화 전 액체의 비중과 경화 후 경화물의 비중값을 사용해 계산한다
해동시간	보관고에서 꺼낸 재료가 사용 가능하게 되는 데 필요한 시간 냉동고에서 꺼낸 후 해동 과정에서 온도에 따른 물성 변화가 있고, 원래의 물성을 되찾기까지 걸리는 시간을 해동시간으로 표시
사용 가능 시간	접착제를 상온(25℃) 에서 사용 가능한 최대 시간 상온에 방치된 접착제는 서서히 점도 상승이 일어나는데, 업계에서는 초기 점도 대비 20% 내지 25% 상승되는 시점을 사용 가능 시간을 정하는 것이 보편적
보관조건	접착제의 보관조건 및 보관시간 안정된 품질 유지를 위해 냉동보관이 필요

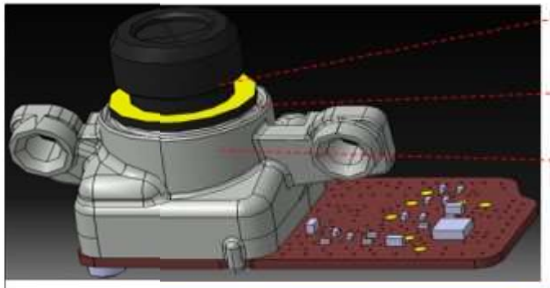
2. A/A EPOXY (YU-UETL1906) Automotive

–Datasheet Review



Color	White
Density [g/cm^3] at room temperature (approx,. 25 ℃)	1.25
Viscosity [cPs] at 25 ℃, Viscometer, shear rate 8 1/s	150,000
Fixing condition by light [mJ/cm^2] LED lamp, 365nm 5~10sec	1,000 ~ 3,000
Curing time with air convection oven [min]	
At +100℃	30
At +90℃	60
Modulus [GPa] DMA	2.0
Shore hardness D	90
Glass transition temperature [℃] DMA	100
Coefficient of linear expansion [ppm.℃] TMA, In a temperature range of below Tg	110
Coefficient of linear expansion [ppm.℃] TMA, In a temperature range of above Tg	140
Shrinkage [vol. %]	5 ↓
Thawing time [min] Room temperature 25 ℃	60
Work life [hr] Room temperature 25 ℃	36
Storage life at -20℃[months] Also – 40℃ to – 20 ℃ possible In unopened original container	6

■. THERMAL EXPANSION SIMULATION DATA



① LENS BARREL : CU CTE 19ppm/K
▶ (20~100°C) 19.3 um [Based on F.F.L 3.55mm]

② AA EPOXY : DELO LT3480 CTE 185ppm/K
▶ (20~100°C) 6.65 um [Based on Nominal Gap 0.50mm]

③ LENS HOLDER : ALDC12 CTE 20.5ppm/K
▶ (20~100°C) 20.58 um [Based on Height of 12.55mm]

SHRINKAGE	BEFORE TG	AFTER TG	TOTAL (um)
LT3480	0.638	6.013	**6.650**
UETL1906	3.318	1.123	**4.440**

2. A/A EPOXY (YU-UETL1906) Automotive

–Dispense Setting & Test

■. Initial Test : Dispense status check

-. Glue weight : 80~85mg

-. UV Cure Parameter (Follow AS-IS MFG condition)

→ UV Power : > 1000mW/cm2

→ UV Exposure time : 3 sec

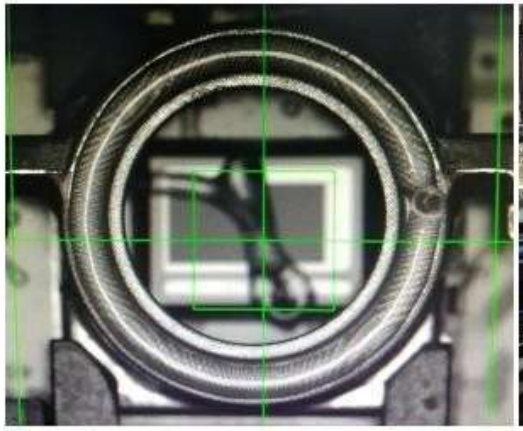
-. Oven Cure Parameter

→ Temperature : 100°c

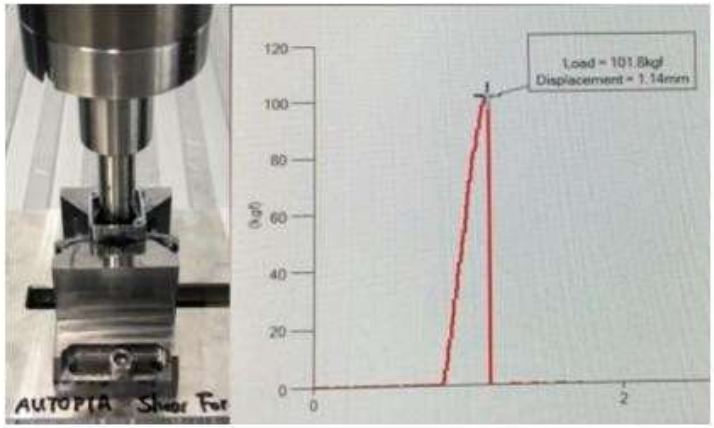
→ Curing time : 45 min

■. Dispense convenience → Good (Better to control)

■. Dispense shape / Area inspection → PR works good, No problem

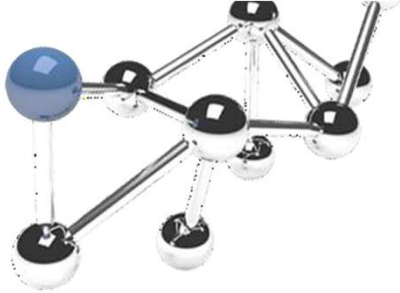


■. Bond Force (with initial 84mg condition) : ~ 102 Kgf



2. A/A EPOXY (YU-UETL1906) Automotive

– Adhesion Strength Validation



■. Push-Pull Test : Epoxy adhesion force result with Exp.time & Epoxy volume (After 24hrs)

Test #	Pair #	Glue Wt. (mg)	UV time (sec)	Push Test Force (Kgf)
1	28	85	4	88.2
2	11	104	4	99.9
3	7	105	8	103.9
4	27	106	12	127.2

Exceptionally Better than Delo-LT3480.

→ The adhesion force is higher at epoxy weight of 100mg than 85mg.
→ The adhesion force is the highest at 12 sec UV-Exp.time fixation.

About 130 Kgf

Compare with As-Is Delo LT3480 Epoxy
: Almost Doubled

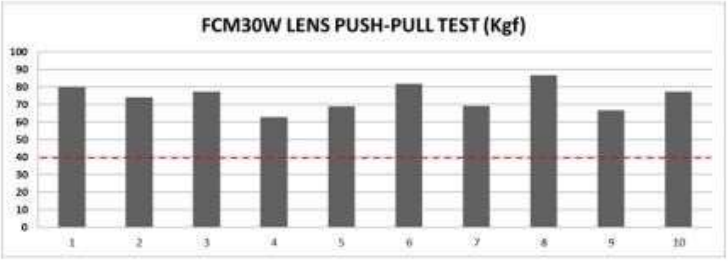
(Delo LT3480 : Avg 70 Kgf)

x 2

AS IS : DELO LT3480 Adhesion Force

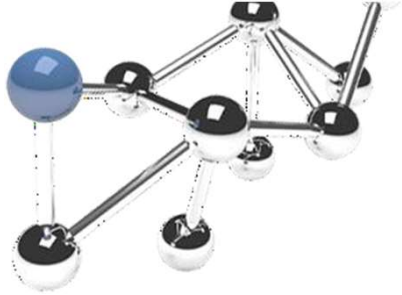
■. FCM30W (FOV100) I.MODULE : TEST RAW DATA

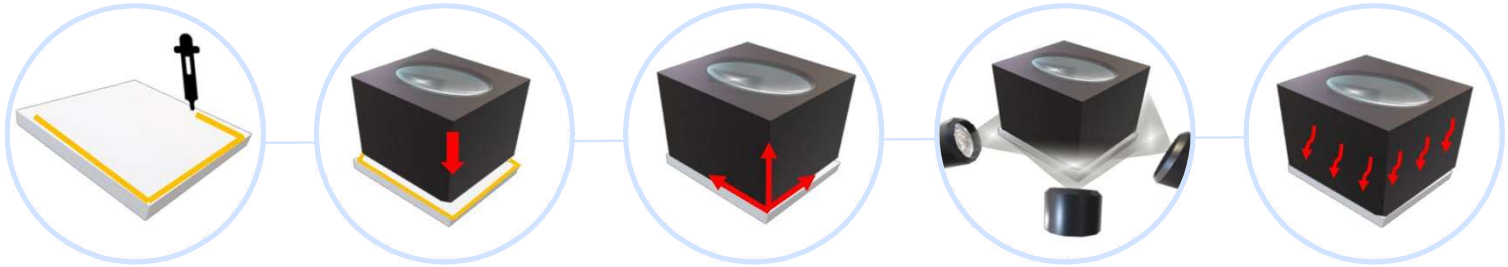
SAMPLE	(Kgf)
#1	79.86
#2	74.24
#3	77.35
#4	62.92
#5	68.95
#6	81.84
#7	69.34
#8	86.8
#9	66.6
#10	77.22
MIN	62.92
MAX	86.8
STDEV	7.48



3. Magic Lancer series Mobile

: Dual Curable Adhesive





✓UV -> Thermal 순서로 경화되는 Dual 경화형 접착제
⇨ 경화 순서가 바뀌어도 경화되는 점이 특징

✓ 낮은 온도에서 경화 반응 시작

✓ RoHS Free

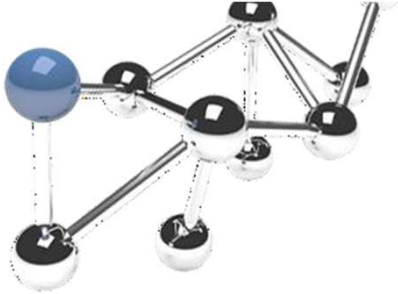
✓ 수축률이 1%대로 낮음

【 Product Specification 】

Specification	Unit	YU-UETL1820P	YU-UETL1825P	YU-UETL1823P
Application		Pre-Focusing	Active Align	Active Align
Viscosity	cPs	5,000	60,000	55,000
Thixotropic Index	-	4.5	5.0	6.0
Adhesion	kgf	> 10 (lens + VCM)	> 20	> 20
Cure Condition	-	80℃ 40min	80℃ 40min	80℃ 40min
Storage	℃	-20 ~ -40	-20 ~ -40	-20 ~ -40
Work Life	hours	40	40	40

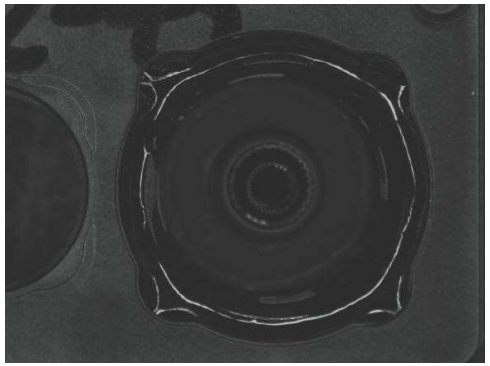
3. Magic Lancer YU-UETL1820P

: Dual Curable Adhesive(Lens Fix – 자동화 장비)

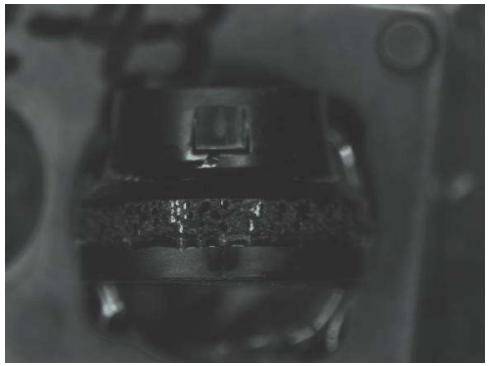


【 Product Specification 】

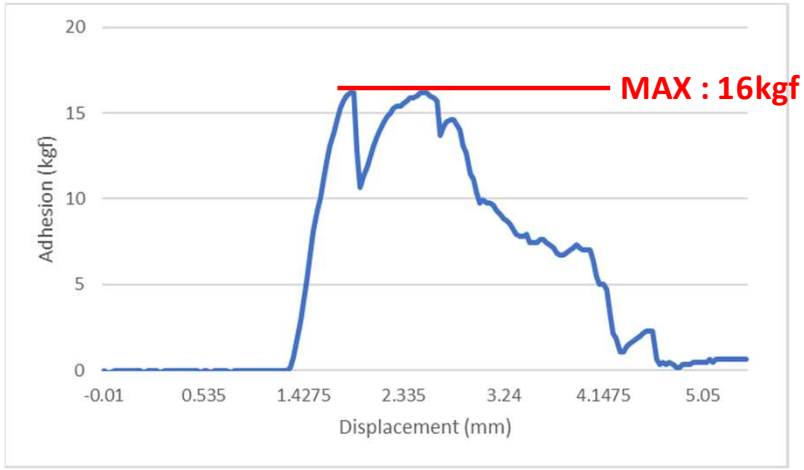
Specification	Unit	YU-UETL1820P
Application		Pre-Focusing
Viscosity	cPs	5,000
Thixotropic Index	-	4.5
Adhesion	kgf	> 10 (lens + VCM)
Cure Condition	-	80℃ 40min
Storage	℃	-20 ~ -40
Work Life	hours	40



< UV + 열 경화 후 >



< 접착력 평가 후 >

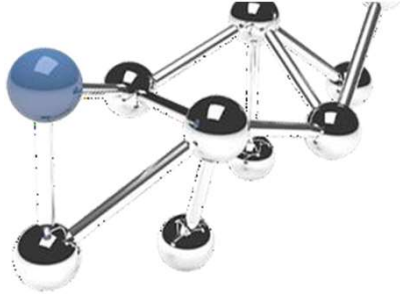


< 접착력 측정 그래프 >

※ 측정 장비 : 인장강도 & Push/Pull
측정속도 : 90mm/sec
측정간격 : 초당 50회
팁 굵기 : 3.5mm

3. Magic Lancer YU-UETL182xP

: Dual Curable Adhesive(Active Alignment)



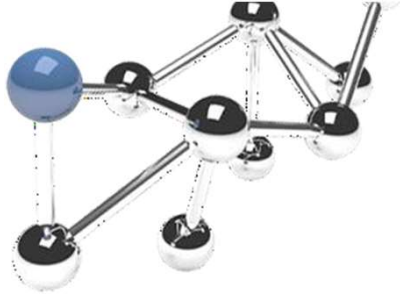
【 Product Specification 】

Properties List		Competitor	YU-UETL1816P	YU-UETL1825P	Remark
Appearance	Color	Beige	Cloudy	Cloudy	
Viscosity	20rpm, at 25 ℃	95,000 cPs ※1	50,000 cPs	60,000 cPs	BROOKFIELD RV DV2
	TI(η2 / η20)	-	5.5	5.0	
Curing	UV (LED)	365nm, 3,000mJ	365nm, 3,000mJ	365nm, 3,000mJ	YUJIN Standard
	Oven	40min at 80℃	40min at 80℃	40min at 80℃	YUJIN Standard
Dispensability	Aspect Ratio	0.56	0.62	0.56	
CTE	α1 [ppm.℃] α2 [ppm.℃]	135 151	169 169	148 148	TMA
Modulus	@25℃ [GPa]	0.48	1.0	0.83	DMA
Tg	[℃]	50.0	107.7	115.0	DMA
Hardness	Shore D	65	78	49	
Adhesion (Ceramic + Glass Holder)	After UV Cure	1.3kgf	1.5kgf	2.9kgf	
	After Oven Cure	1.9kgf	4.5kgf	4.1kgf	
Adhesion (Ceramic + Glass Filter)	After UV Cure	1.6kgf	27.0kgf	29.2kgr	
	After Oven Cure	6.9kgf	38.8kgf	42.5kgf	

※1. Competitor TDS

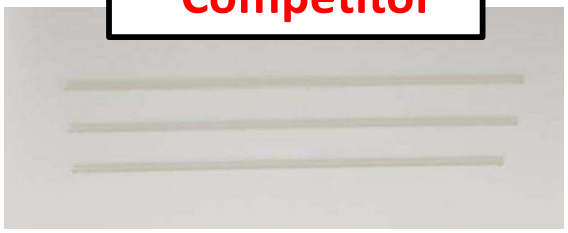
3. Magic Lancer YU-UETL182xP

: Dual Curable Adhesive(Active Alignment)



[경쟁사 제품과 Aspect Ratio 비교 : Spec 0.5 이상]

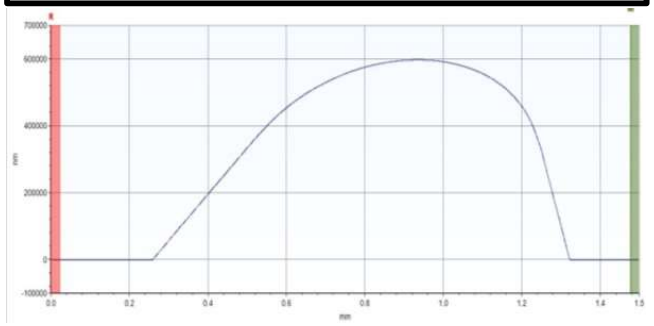
Competitor



무사시 토출장비, 27G Needle
토출압력 : 550kPa, 속도 : 0.5mm/s
간격 : 400㎛

YU-UETL1816P

무사시 토출장비, 27G Needle
토출압력 : 300kPa, 속도 : 1mm/s
간격 : 700㎛



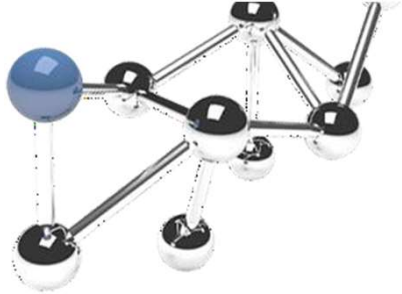
YU-UETL1825P

무사시 토출장비, 27G Needle 토출압력 : 500kPa, 속도 : 1.5mm/s
간격 : 500㎛

	Competitor				YU-UETL1816P				YU-UETL1825P			
Line NO.	1	2	3	Avg.	1	2	3	Avg.	1	2	3	Avg.
Width (㎛)	455	441	453	**449.7**	1,010	1,030	926	**988.7**	854	852	855	**853.7**
Height (㎛)	255	248	253	**252.0**	611	634	579	**608.0**	475	475	479	**476.3**
Aspect Ratio	0.56	0.56	0.56	**0.56**	0.60	0.62	0.63	**0.62**	0.56	0.56	0.56	**0.56**

3. Magic Lancer YU-UETL182xP

: Dual Curable Adhesive(Active Alignment)



[경쟁사 제품과 접착력 비교]

[Competitor]

Musashi
27G Needle
토출압력 : 550kPa
속도 : 1.2mm/s
간격 : 150㎛

[YU-UETL1816P]

Musashi
27G Needle
토출압력 : 250kPa
속도 : 5mm/s
간격 : 150㎛

[YU-UETL1825P]

Musashi
27G Needle
토출압력 : 250kPa
속도 : 5mm/s
간격 : 150㎛

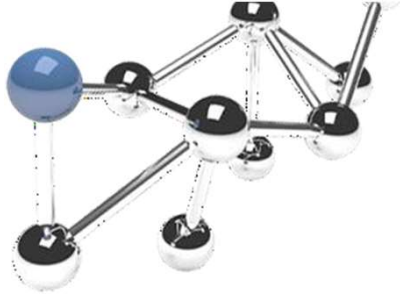
< Adhesion Test Result >

※단위 : kgf

Curing Method	Competitor				YU-UETL1816P				YU-UETL1825P			
	1	2	3	Avg.	1	2	3	Avg.	1	2	3	Avg.
Only UV	1.423	1.268	1.147	1.279	1.307	1.703	1.556	1.522	3.291	2.736	2.812	2.946
UV+Thermal	1.947	2.063	1.633	1.881	4.421	4.576	4.674	4.547	4.218	4.040	4.128	4.129

4. Globe Lock Series

: UV Energy를 흡수하여 경화 반응을 일으키는 접착제



Composition

1 Photo initiator
- 경화 반응 개시
  →Monomer, Oligomer

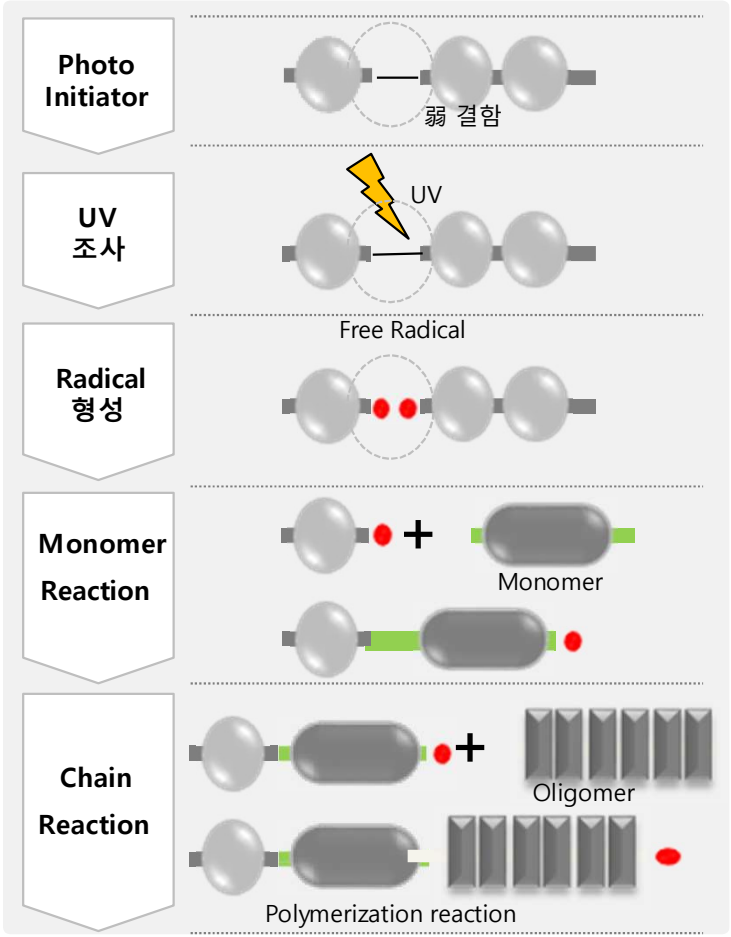
2 Additive (=Antioxidant)
- 열화 방지
  → 熱에 의한 황변 방지

3 Plasticizer
- Resin의 Soft성부여
  → Hardness 조절(유연성)

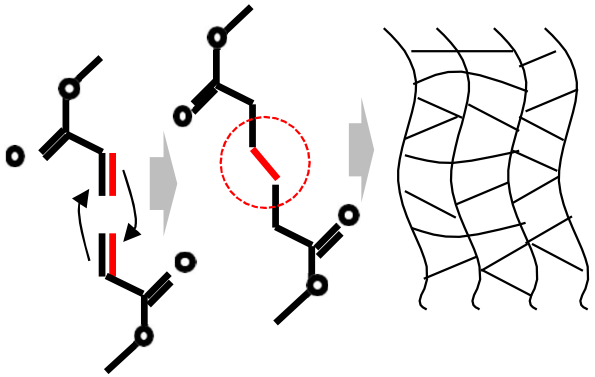
4 Monomer
- Oligomer물성 보완
  → Modulus,Tg, 탄성율

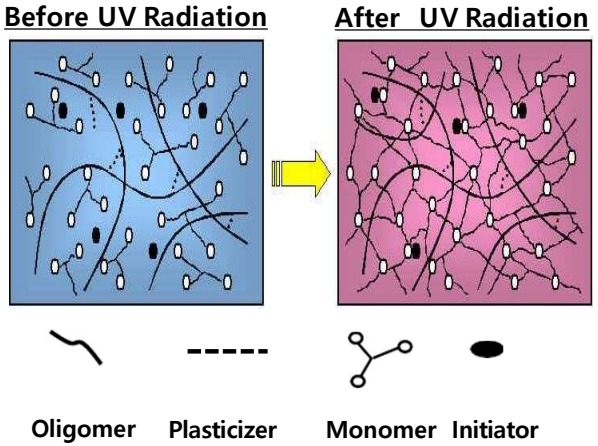
5 Oligomer
- 기본 물성 부여
  → 수축, 연성,유전율

Reaction Mechanism



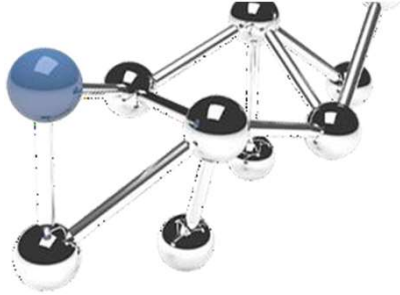
Polymerization

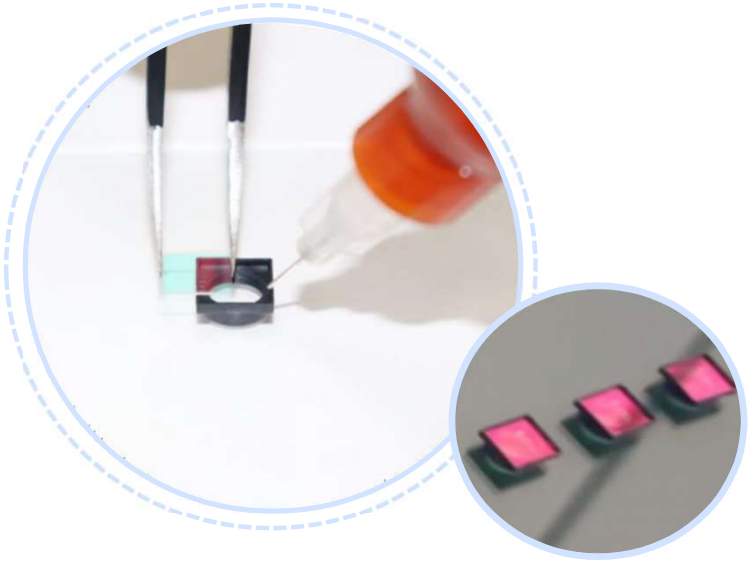


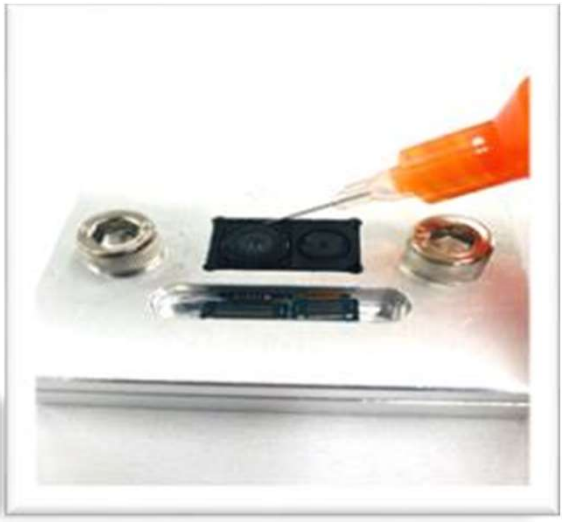


4. Globe Lock Series

: UV Resin for Camera Module







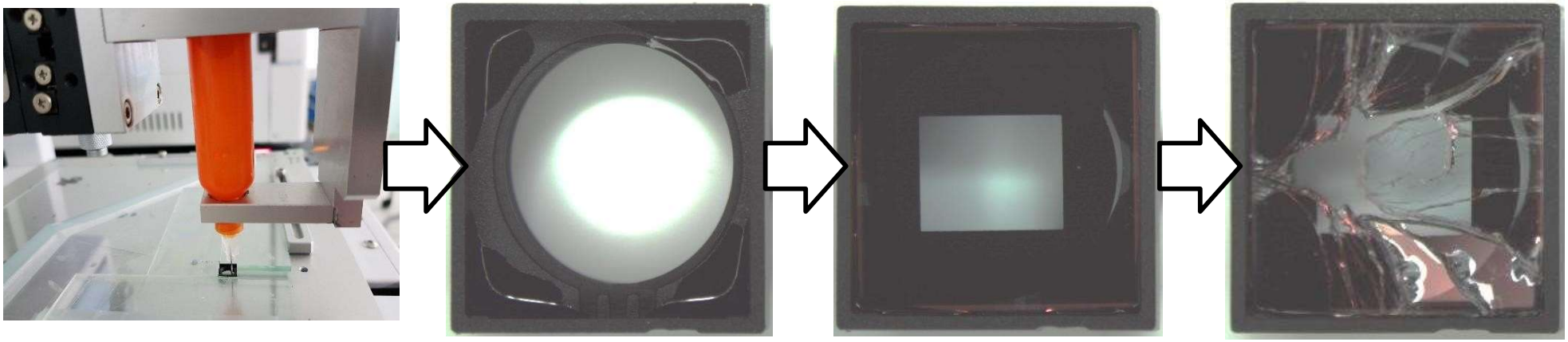
- ✓ Glass Filter 접착력이 2.5kgf 이상으로 매우 우수
- ✓ 빠른 경화 반응 속도
- ✓ LED 경화에 최적화

【 Product Specification 】

Specification	Unit	YU-UL1785P	YU-UL1879P
Application		IR attach bonding Neck Reinforcement	Flange bonding
Color		Clear	Cloudy
Viscosity	**cPs**	15,000	6,000
Adhesion	**kgf**	> 2.5	> 7.0
Cure Condition	**-**	LED 385nm	LED 365nm
Storage	**℃**	5 ~ 30	5 ~ 30
Warranty	**months**	6	6

4. Globe Lock YU-UL1785P

: UV Resin for IR Attach in Camera Module Process



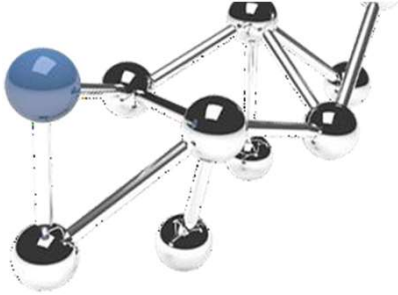
※ 레진 도포량 약 1mg

[접착력 실험 후 사진]

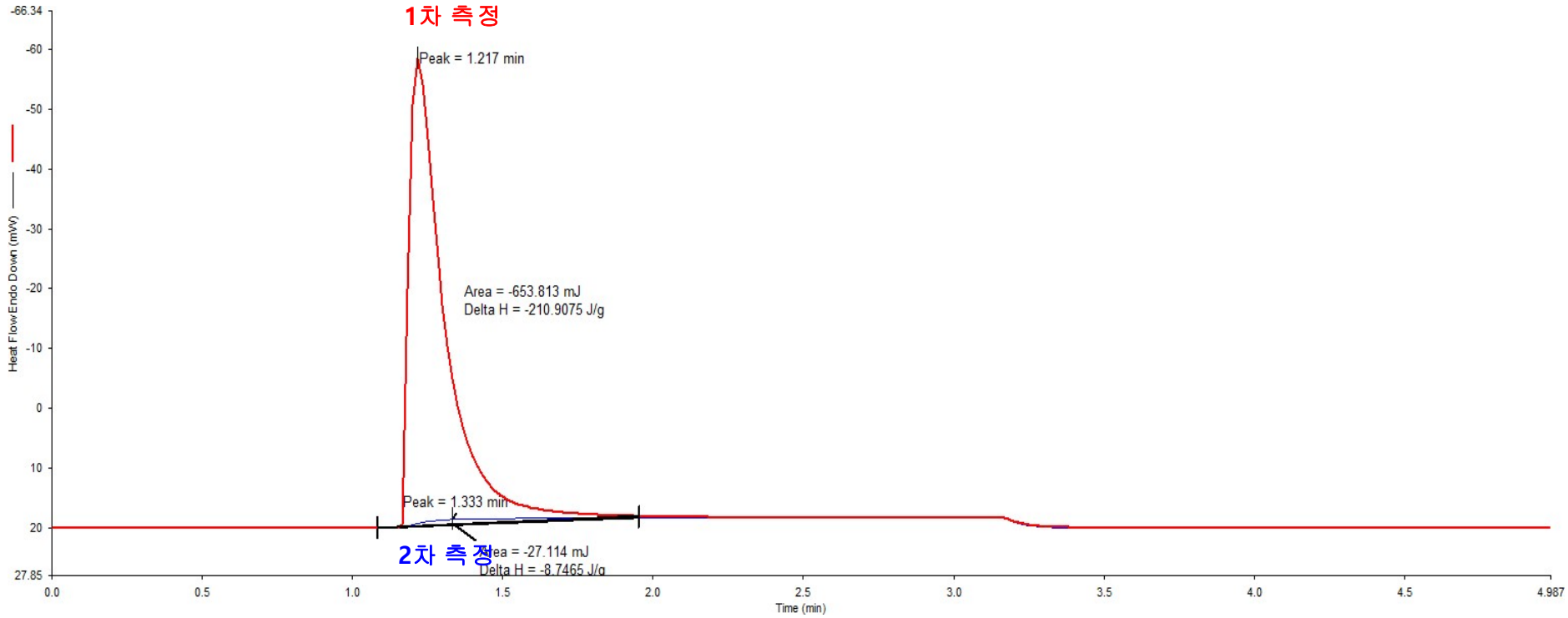
광량 [mJ/cm²]	경화 시간 [sec]	접착력 [kgf]				사진
		#1	#2	#3	Avg.	
2,700	3	3.7	2.7	2.4	2.93	
5,400	6	3.7	2.9	3.5	3.37	
8,100	9	3.5	2.4	3.4	3.10	
10,800	12	2.6	2.9	3.7	3.07	
13,500	15	2.9	3.0	3.8	3.23	
16,200	18	2.4	3.7	2.3	2.80	
18,900	21	2.4	2.9	2.9	2.73	
22,500	25	1.8	2.6	2.7	2.37	

4. Globe Lock YU-UL1785P

: UV Resin for IR Attach in Camera Module Process



[경화 전/후 Photo DSC]

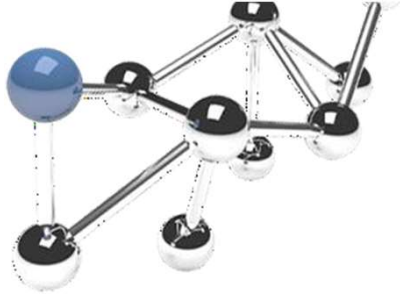


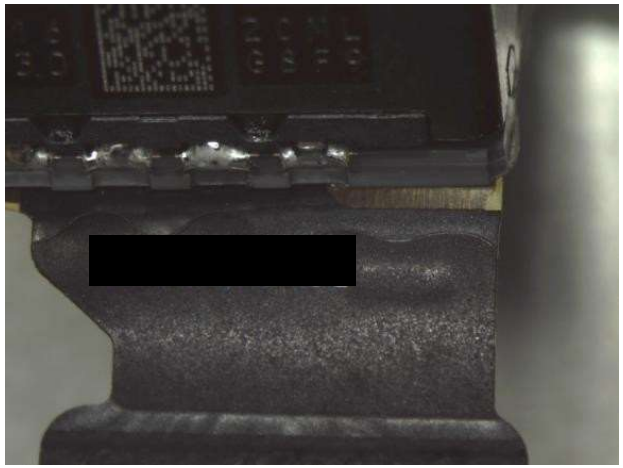
✓ **Photo-DSC를 2회 연속 측정하였을 때의 Peak 차이를 통해 UV 경화시의 경화율을 판단**

✓ **본 제품의 경화율은 95% 이상**

4. Globe Lock YU-UL1785P

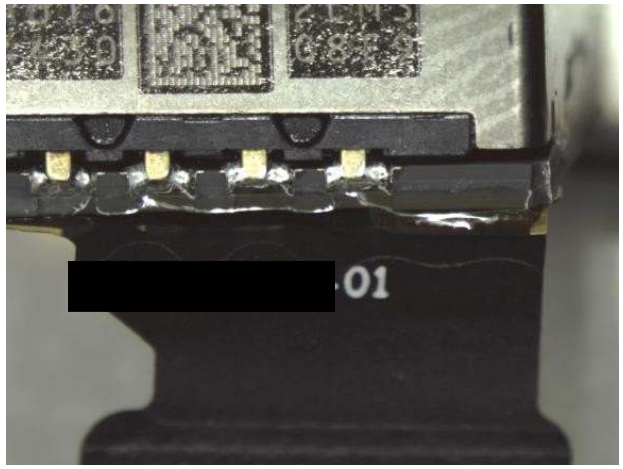
: UV Resin for **Neck Reinforcement** in Camera Module Process



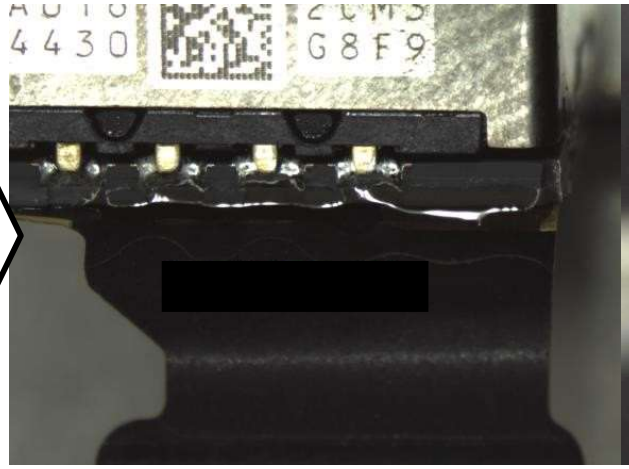


< VCM+FPCB 초기 상태 >

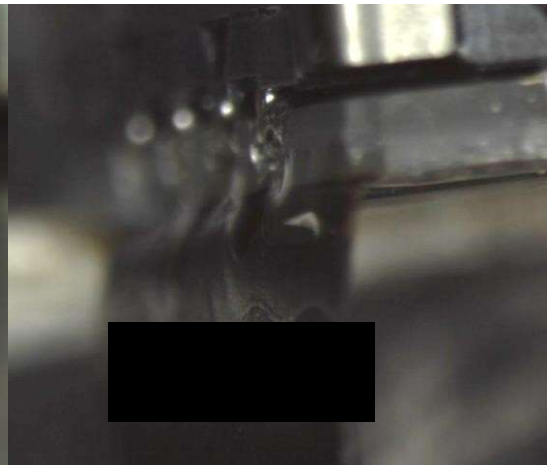
< 접착제 토출>



< UV경화 후 >



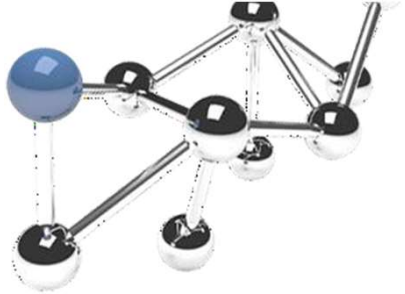
< 100차례 굽힘시험 후 >



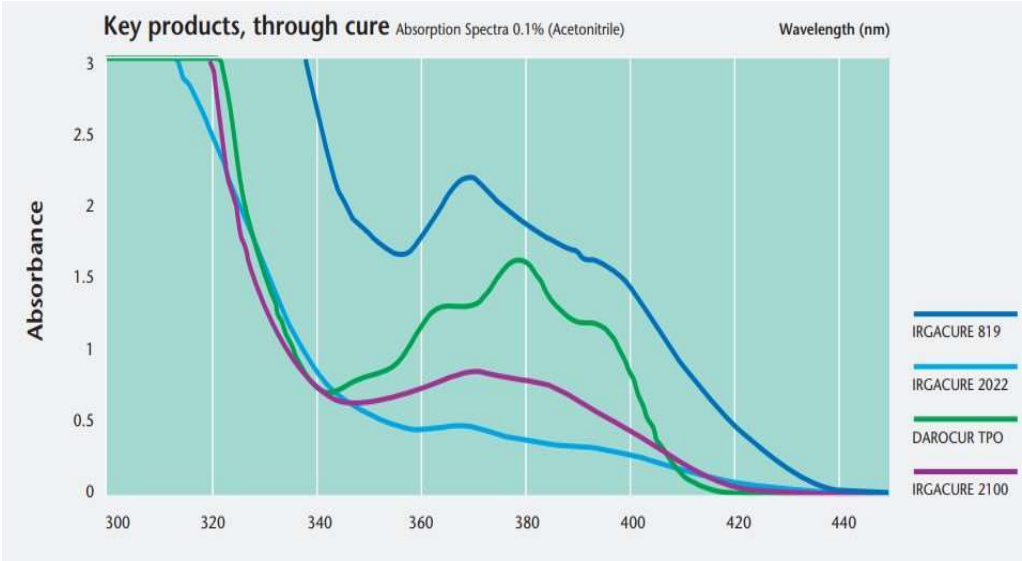
< 90° 굽힘 형상>

5. Globe Lock YU-UL1879P

: UV Resin for Flange in Camera Module Process

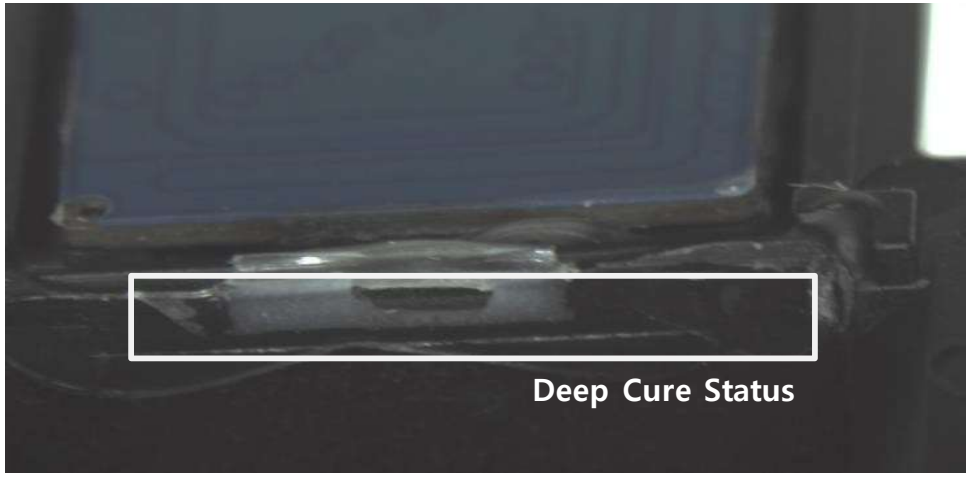


✓ 다양한 흡수 파장대를 가진 개시제를
상호 보완적으로 사용
⇨ 재료 심부까지 경화가 가능하도록 제작



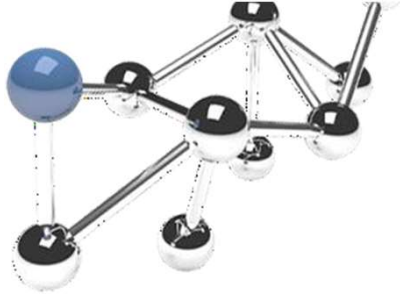
Camera Flange 탈거력 성능(kgf)

샘플	시료 No.	UW	Bokeh
YU-UL1879P	1	10.7	12.68
	2	11.91	13.19
	3	11.56	11.15
	평균		



5. Globe Lock YU-UL1879P

: UV Resin for **Flange** in Camera Module Process



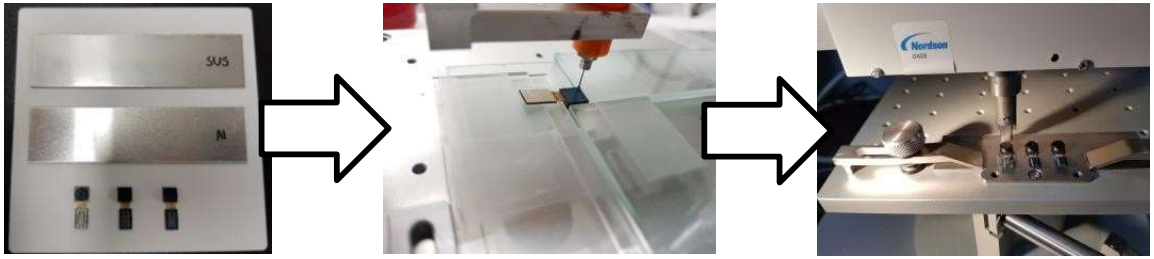
[금속에 대한 우수한 접착력]

접착제	점도	T.I	피착제
유진케미칼 YU-UL1879P	6,313	4.65	SUS + VCM Al + VCM
경쟁 S사 제품	5,438	4.25	

※ 점도, T.I는 유진케미칼 측정 기준 (Brookfield RVDV2, SSA, #14, @25.0℃)

➢ 평가방법

1. Sheet형태의 기판과 임의의 VCM을 준비
2. Dispensing 방식으로 토출 및 UV경화
3. Die Shear 방식으로 접착력 측정



※ 유진케미칼 보유 기판
※ 토출 조건 : 27G, 100kPa, 200㎛ gap, 10mm/s
※ 경화 조건 : 365nm LED, 2,400mJ/㎠ 의 광량

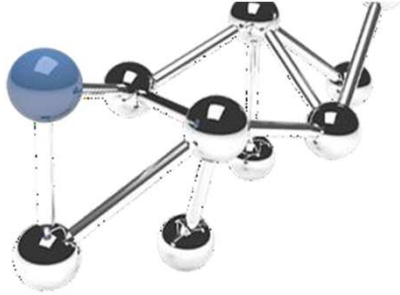
➢ 탈거력 측정 결과 (kgf)

샘 플	번호	SUS	Al
YU-UL1879P	1	9.971	8.041
	2	11.808	6.420
	3	14.750	7.318
	평균	12.176	7.260
경쟁 S사 제품	1	6.461	3.604
	2	6.264	2.522
	3	5.999	3.097
	평균	6.241	3.074

※ 측정장비 : Dage4000, DS100 cartridge

5. Globe Lock YU-UL1879P

: UV Resin for **Flange** in Camera Module Process



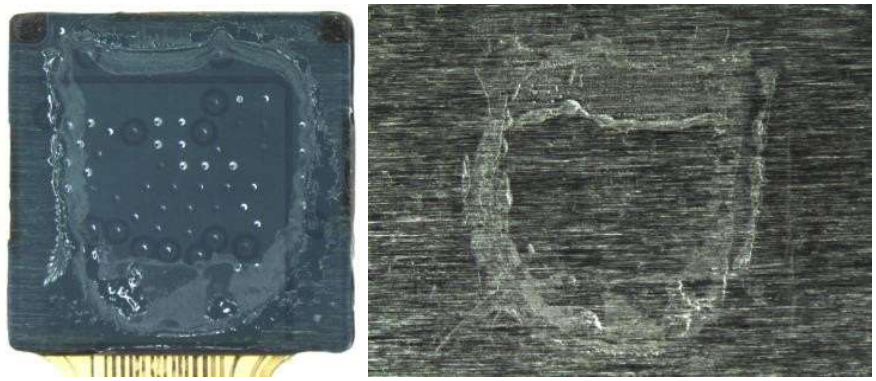
[YU-UL1879P] / SUS 기판

[경쟁 S사] / SUS 기판

[YU-UL1879P] / Al 기판

- 경화성 양호, 심부도 잘 경화된 형태
- 접착제 파괴가 일어나, 기판과 VCM 양 층에 경화물이 잔존

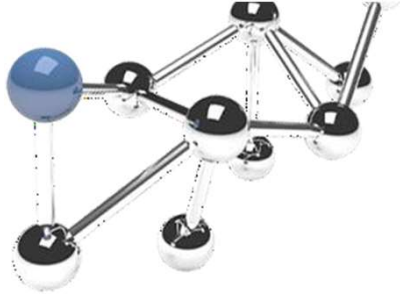
[경쟁 S사] / Al 기판



- 경화성 불량, 액상의 형태로 남아있는 부분도 있음

Intro IRIS Rainbow Series

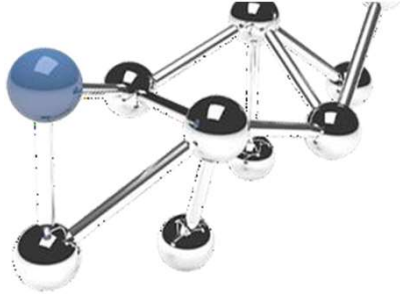
-.Conductive Adhesive



Conductive Adhesive

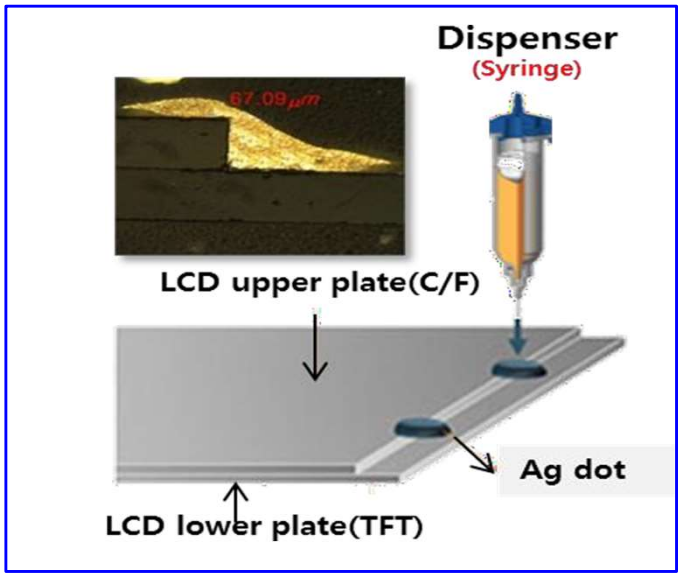
Classification	Cure Method	Using	Resistance	Applications
상온건조형	Volatilizing	Dispensing / Jetting	8×10-5 Ω·cm	Display Module
Thermal	Thermal	Dispensing / Screen Printing	5×10-5 Ω·cm	TSP / Camera Module
Low Sintering	Thermal	Dispensing / Screen Printing	1×10-5 Ω·cm	Speaker / Camera Module

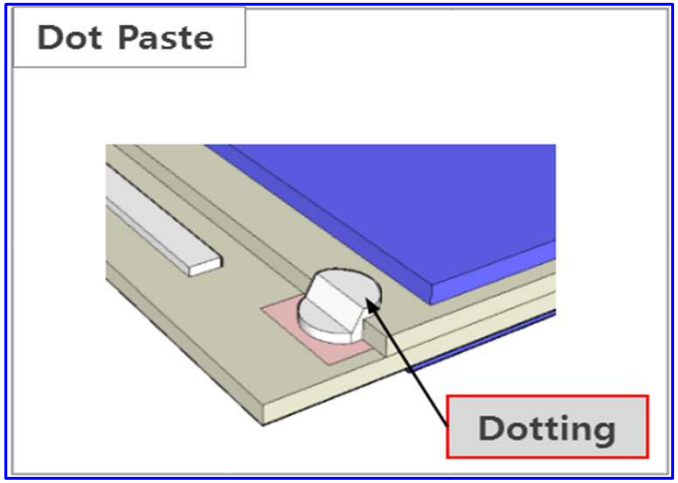
6. 상온 건조형 Conductive Paste



: IPS Panel의 C/F or Top POL 표면에 발생하는 정전기를 Ground 처리하기 위한 재료

【 Product concept 】



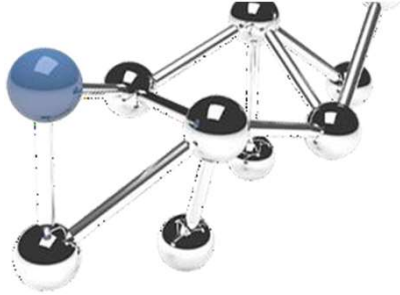


- ✓ 경화반응 없이 용제의 휘발만으로 특성 발휘
- ✓ 표면 건조 속도가 빠르고, 표면건조 이후 후공정 진행 가능
- ✓ 경화후의 저항값이 우수
- ✓ 고온 고습 등 신뢰성 시험에서 Crack 無

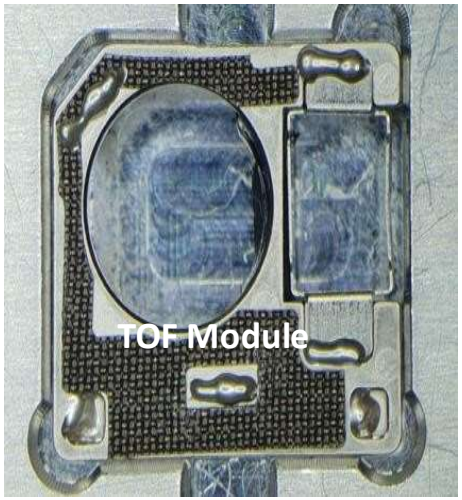
【 Product Specification 】

Specification	Unit	Ag paste (YU-AR1701)	Black paste (YU-ABR1701)
Solids contents	%	43 ± 1	48 ± 1
Viscosity	cPs	5,250 ± 500	5,500 ± 500
Jetting	-	OK	OK
T.I.	-	5.0	1.6
Dot Resistance	Ω	< 1.0	< 1.0
Curing Condition	-	Surface drying 10min Complete drying 24hour	Surface drying 10min Complete drying 24hour
Storage	-	1~5℃	< -20℃

7. Thermal Conductive Paste



【 Product concept 】



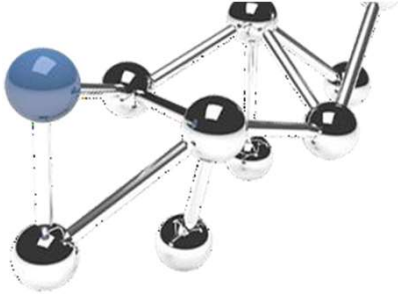
- ✓ PET, PI, Glass 등. 다양한 기재에 적용 가능
- ✓ 저온 경화 가능, 우수한 전기 저항
- ✓ 직진성 및 인쇄 특성 구현 능력 우수
- ✓ 다양한 경화조건
- ✓ 신뢰성 시험에서 성능 열화 없음
- ✓ 높은 은 함량

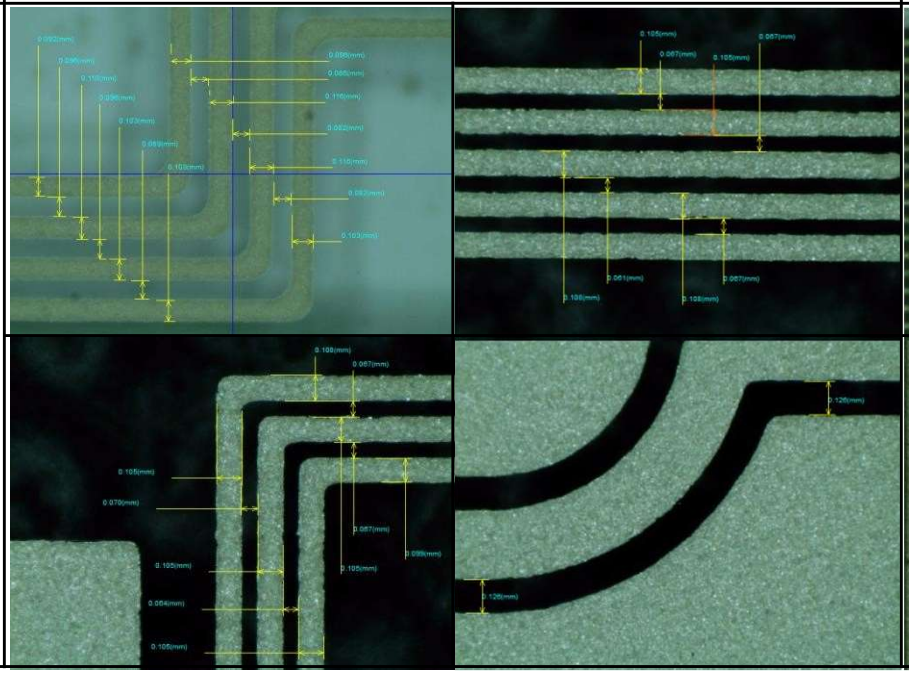
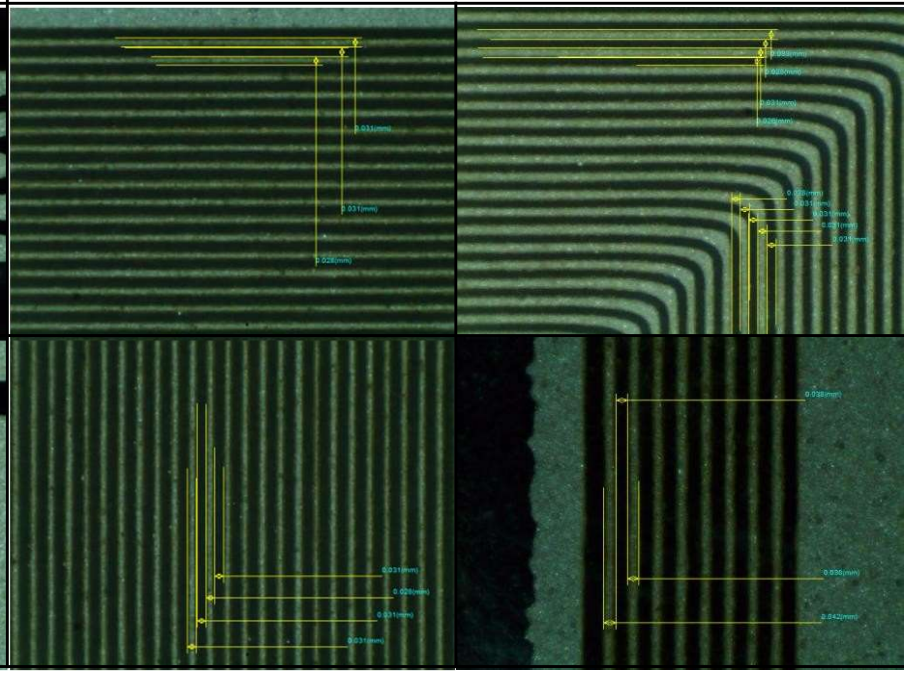
【 Product Specification 】

Item	Unit	YU-AR1788	YU-AT1795	YU-AT1803P
Cosmetic		Silver Color	Silver Color	Silver Color
Curing Condition	℃	80℃ × 90min 130℃ × 30min	80℃ × 90min 130℃ × 30min	80℃ × 40min
Solid Content	%	71.55	71.70	79.00
Particle Size	㎛(D50)	1.23	1.23	2.0 / 7.0㎛
Viscosity	cPs	75,000	32,000	45,000
Thixotropy Index(TI)	2rpm/ 20rpm	6.0	3.5	4.2
Specific gravity	g/mL	2.8	2.7	2.4
Resistivity	μΩ·㎝	42	65	100
Adhesion	-	5B	5B	-
Hardness	-	3H (on Glass) 4H (on PET)	3H (on Glass) 4H (on PET)	65D
Etc.		Direct Printing	Laser Etching	Dispensing

7. Thermal Conductive Paste

: 일반 Screen Printing으로 100/80 미세선폭 구현이 가능하며, 레이저Type의 경우 30/30㎛ 가능



	YU-AT1788	YU-AT1795
Line / Space	100 / 80 ㎛	30 / 30 ㎛
Fig.		

스크린인쇄. ST400 메쉬

7. Thermal Conductive Paste

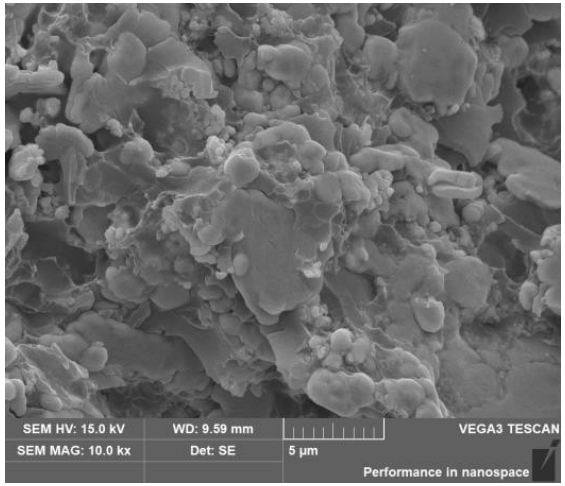
< SUS 상면에 인쇄>
< PI두께 : 50㎛ >

< PI 필름 박리 >

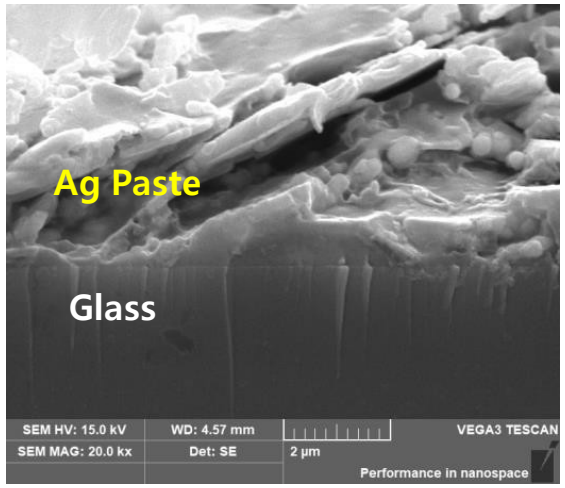
< 세라믹 칩 낙하 >
⇨ 오븐 경화

< 접착력 측정 >
전단 응력 측정법

No.	접착력 (kgf)
1	26.509
2	21.038
3	22.019
4	26.406
5	23.520
Avg.	23.8984



< 주사전자현미경 사진 (10,000배) >



< 주사전자현미경 사진 (20,000배) >

제품의 특징

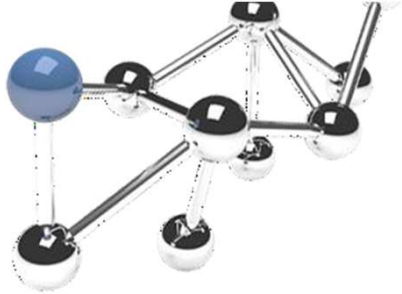
-. 여러 종류의 은 분말이 포함된 치밀한 접착제 단면
(충진률 증가로 인한 도전 Path 증대 ⇨ 낮은 전기저항)

-. 금속, 유리 등 다양한 기판과의 우수한 접착력
(적절한 고분자 물질 선정을 통해 밀착성 우수)

-. 스크린 인쇄 / 디스펜싱 등 다양한 공법에 적용 가능

7. Thermal Conductive Paste

: RoHS 대응 : 6대 중금속 N.D, Halogen Free 대응



Sample No. : AYGA19-01562.001
Sample Description : YU-AT1803P
Item No./Part No. : N/A
Materials : N/A

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	With reference to IEC 62321-5:2013 (Determination of Cadmium by ICP-OES)	0.5	N.D.
Lead (Pb)	mg/kg	With reference to IEC 62321-5:2013 (Determination of Lead by ICP-OES)	5	N.D.
Mercury (Hg)	mg/kg	With reference to IEC 62321-4:2013 (Determination of Mercury by ICP-OES)	2	N.D.
Hexavalent Chromium (Cr VI)*	mg/kg	With reference to IEC 62321-7-2:2017, determination of Hexavalent Chromium by Colorimetric Method using UV-Vis and Microwave system/or with reference to IEC 62321-5:2013, determination of Chromium by ICP-OES.	8	N.D.
Antimony (Sb)	mg/kg	With reference to EPA 3052(1996), US EPA 6010B(1996), ICP	10	N.D.
Tin (Sn)	mg/kg	With reference to EPA 3052(1996), US EPA 6010B(1996), ICP	10	N.D.

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Monobromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Dibromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Tribromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Tetrabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Pentabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Hexabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Heptabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Octabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Nonabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Decabromobiphenyl	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.

Sample No. : AYGA19-01562.001
Sample Description : YU-AT1803P
Item No./Part No. : N/A
Materials : N/A

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Monobromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Dibromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Tribromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Tetrabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Pentabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Hexabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Heptabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Octabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Nonabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.
Decabromodiphenyl ether	mg/kg	With reference to IEC 62321-6:2015 (Determination of PBBs and PBDEs by GC-MS)	5	N.D.

Phthalates

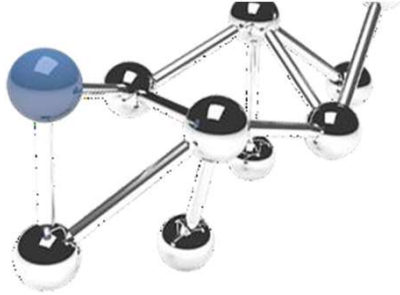
Test Items	Unit	Test Method	MDL	Results
Di-(2-ethylhexyl) phthalate (DEHP)	mg/kg	With reference to IEC 62321-8 ; 2017 , GC/MS	50	N.D.
Di-butyl phthalate (DBP)	mg/kg	With reference to IEC 62321-8 ; 2017 , GC/MS	50	N.D.
Benzyl butyl phthalate (BBP)	mg/kg	With reference to IEC 62321-8 ; 2017 , GC/MS	50	N.D.
Di-isobutyl phthalate (DIBP)	mg/kg	With reference to IEC 62321-8 ; 2017 , GC/MS	50	N.D.

Halogen Content

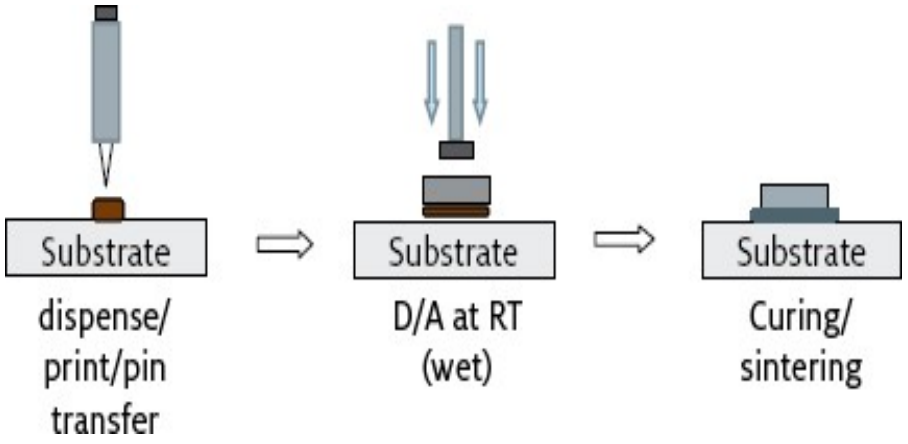
Test Items	Unit	Test Method	MDL	Results
Bromine(Br)	mg/kg	With reference to EN 14582:2016, IC	30	N.D.
Chlorine(Cl)	mg/kg	With reference to EN 14582:2016, IC	30	N.D.

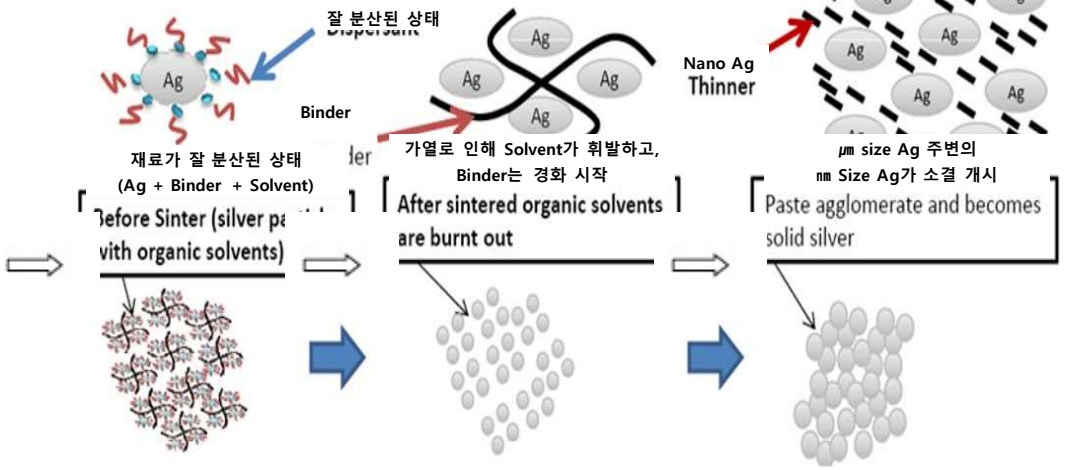
8. Low Temp. Sintering Conductive Paste

: 낮은 온도에서 소결되어 높은 열전도도, 전기전도도를 발휘하는 Silver Paste



【 Product concept 】





✓ 가압 없이 소결되는(Pressure-less Sintering) 실버 페이스트

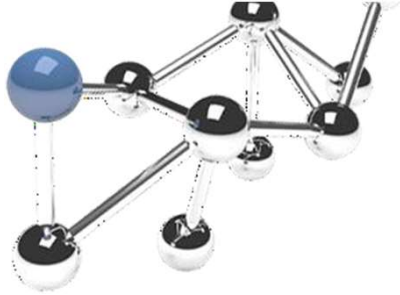
✓ 고점도임에도 공압 디스펜싱 법에 최적화,
200㎛ 내경의 니들에서도 작업 가능

✓ BTX계 용제 및 납 등의 환경 유해물질이 포함되어 있지 않음

【 Product Specification 】

Item	Unit	YU-AT1852
Viscosity (η20)	cPs	238,000
Density (경화 전)	g/㎤	4.4
Density (경화 후)	g/㎤	8 이상
Thermal Conductivity	W/m·K	170 이상
Volume Resisvity	Ω·㎝	1×10-5
Chip Adhsion Strength	kgf	3.7
Curing Condition	-	200℃ 90min

8. Low Temp. Sintering Conductive Paste



Thermal Diffusivity - NETZSCH LFA Analysis

General information

Database :	0115_yujin.mdb	**Operator :**	LJH
Instrument :	LFA 457	**Customer :**	YUJIN
Identity :	GERI	**Remark(mment) :**	RT
Date/time :	2018-01-15 14:09:25	**Cp table :**	#14.cpe
Material :	#14	**Expansion table :**	dL_const
Ref. density (20.0 ℃) /(g/cm^3) :	8.900	**Diffusivity table :**	diff_const
Sample :	#14	**Temp. recalib. file :**	Tcalzero.tcx
Type :	In-plane	**Purge gas :**	used
Coating :	YES	**Furnace :**	LFA 457 Medium Rg
Thickness (RT) /mm :	0.3900	**Sample holder :**	unknown
D0 /mm :	4.980	**Laser :**	LFA 457 Laser
D1 /mm :	9.500	**Centering cone :**	IN-PLANE
D2 /mm :	11.960	**Center cone ratio :**	0.70
Sensor :	InSb	**Furnace TC :**	S
Beam enlargement : /mm	12.7	**Sample TC :**	S
Laser filter : /%	100.0	**Sample Xp / Tn :**	3.00 / 0.64
Atmosphere :	Ar	**Furnace Xp / Tn :**	3.56 / 0.48
Gas flow : /(ml/min)	50.00	**Calculation code :**	Ip,i/I/1-0-0
Laboratory :	TA		

Results

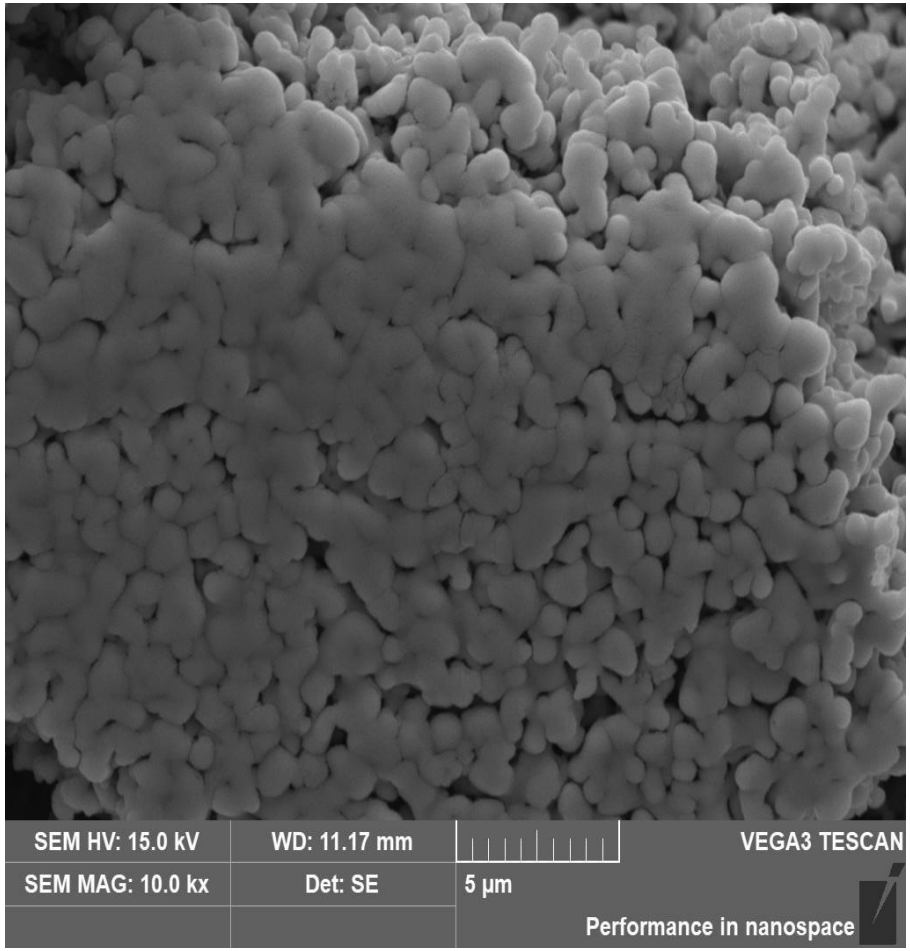
Shot number	Temperature ℃	Model	Diffusivity mm^2/s	Conductivity W/(m*K)	Cp J/g/K	Laser voltage V	Pulse width ms
1	25.8	In-plane, i.	48.882	213.129	0.490	2498.0	0.50
2	25.8	In-plane, i.	50.744	221.249	0.490	2498.0	0.50
3	25.8	In-plane, i.	49.173	214.400	0.490	2498.0	0.50
4	25.8	In-plane, i.	49.879	217.479	0.490	2498.0	0.50
5	25.9	In-plane, i.	49.214	214.579	0.490	2498.0	0.50
Mean:	**25.8**		**49.578**	**216.167**	**0.490**		
Std. Dev.:	**0.0**		**0.747**	**3.257**	**0.000**		

$$\lambda(T) = \rho(T) \cdot c_p(T) \cdot a(T)$$

열전도율 = 열확산율 × 비열 × 밀도

✓ 소결후 치밀한 막을 형성

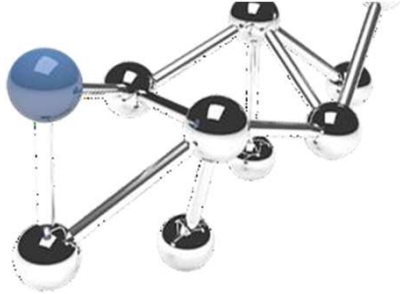
⇨ 높은 비중과 열 확산도를 나타냄

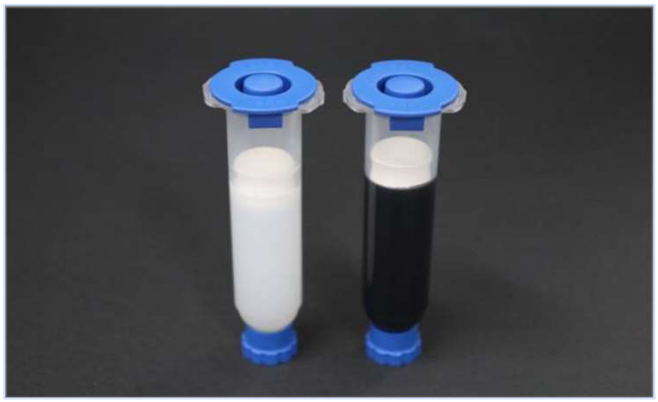


< SEM image. ×10,000 >

9. VULCAN Series

: 저온 열경화형 접착제





✓ 낮은 온도에서 경화 반응 시작

✓ 짧은 시간에 강한 반응

✓ LCP, PC 등 다양한 기재에 우수한 접착력

【 Product Specification 】

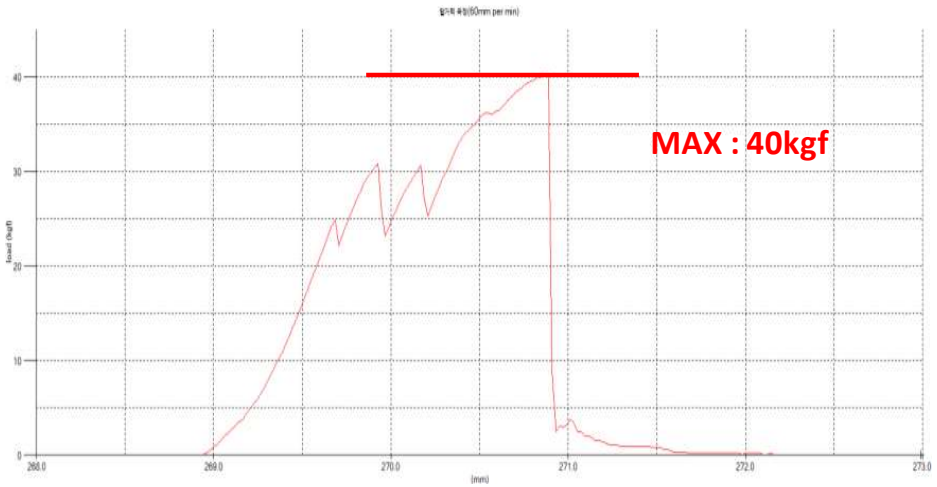
Specification	Unit	YU-ET1902B	YU-ET1903P	YU-ET1819P
Application			Lens Fix	Heat Radiating
Viscosity	**cPs**	15,000	7,000	50,000
Thixotropic Index	**-**	5.0	2.5	2.0
Adhesion	**kgf**	> 4 (Magnetic chip + SUS sheet)	> 30 (lens + VCM)	-
Cure Condition	**-**	80℃ 30min	80℃ 30min	80℃ 30min
Storage	**℃**	-20 ~ -40	-20 ~ -40	-20 ~ -40
Work Life	**hours**	24	24	24

9. VULCAN Series

: 저온 열경화형 접착제

【 Product Specification 】

Specification	Unit	YU-ET1903P
Application		Pre-Focusing
Viscosity	cPs	7,000
Thixotropic Index	-	2.4
Adhesion	kgf	> 30 (lens + VCM)
Cure Condition	-	80℃ 30min
Storage	℃	-20 ~ -40
Work Life	hours	24



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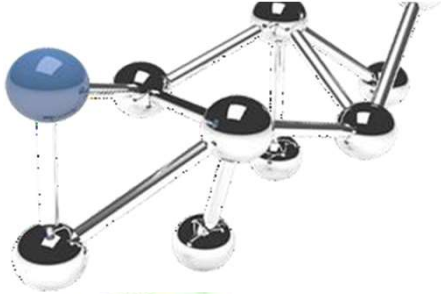
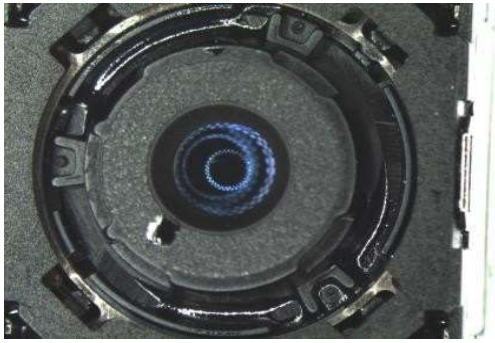
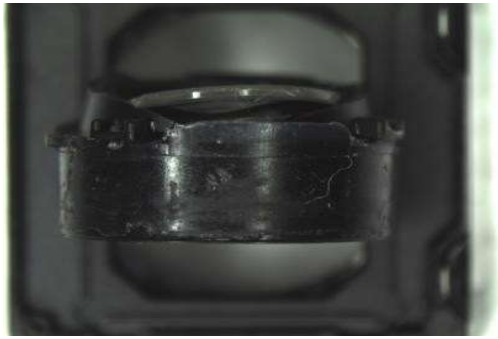




< 열 경화 후 >

< 탈거력 측정 후 Lens >



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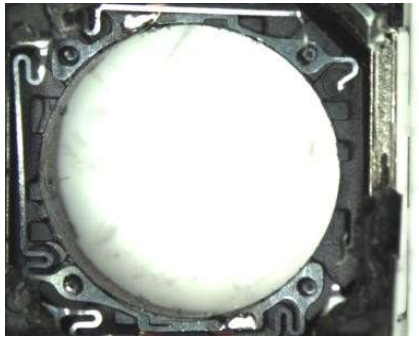


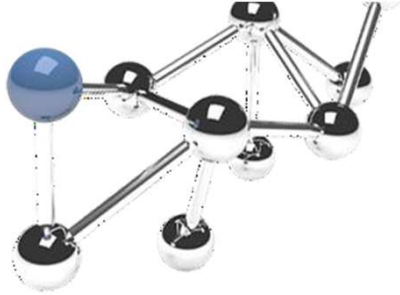
< 배면. IR Base로 넘치지 않음 >

✓ 흐름성 최적화를 통해 접촉면적은 최적, 배면 흐름은 방지

✓ PC + LCP 재질에서 경쟁사 2배 이상의 탈거력
(Lens가 완전히 깨어질 정도수준)

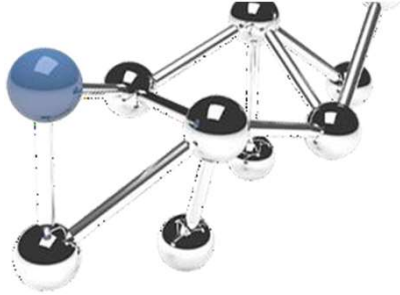
10. VULCAN Series

- VCM & OIS Actuator(AF용)_YU-ET2104J



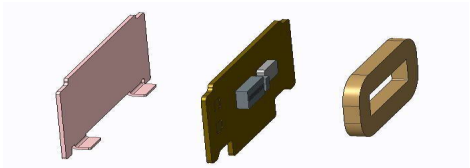
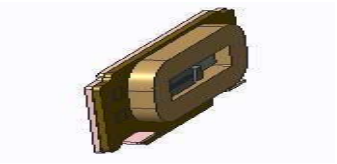
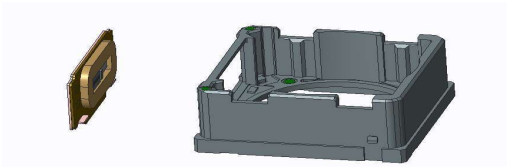
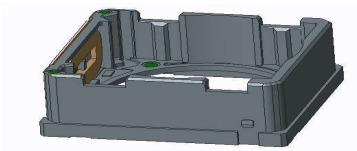
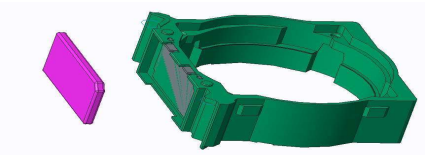
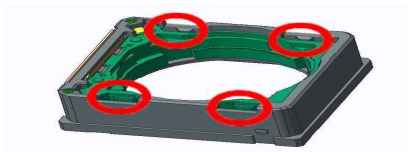
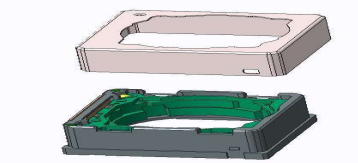
Specification List		Result	Measurement Method	Remark
Color		**Black**	Appearance	
Density [g/cm3]		**1.2**	at room temperature(approx,. 25℃)	
Viscosity [cPs]		**21,000 ±3,000**	at 25℃, Viscometer, η20	
Thixotropic [Index]		**6.0±1.2**	at 25℃, Viscometer, η20	
Oven Curing Time [min]		**30**	at +80℃	
Hot plate Curing Time [sec]		**90~150**	at +100℃	Reference of receiving epoxy
Tg[℃]		**48±5**	DMA	
CTE [ppm]	α1	**91**	TMA	
	α2	**201**		
Cure Shrinkage [vol. %]		**5**	TGA or 비중계	
Work Life [day]		**7**	Viscometer	
Storage life at -20℃ [month]		**6**	Viscometer	

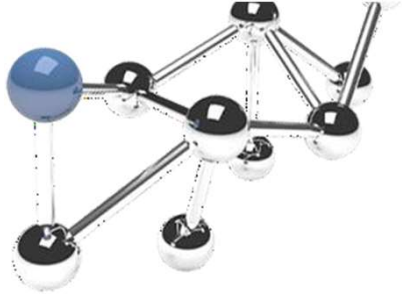
▣ Proposal VCM Adhesive



1.적용공정 : FPCB Ass'y, Housing Ass'y, Carrier Ass'y, Full Ass'y

2. 제안 Adhesive : YU-ET2104J

	현 적용 Adhesive	Proposal Adhesive
Model	EICT AD1384	YU-ET2104J
Viscosity	18,000	21,000
Ti	5	5
상온안정성(시간)	72hr	**168hr**
35℃(Jet Dispenser) 안정성	X	**5days 이상**
DSC(경화율) 경화시간	8.3min	**3.5min**
FPCB Ass'y (Yoke + FPCB + Coil)		
Housing Ass'y (FPCB + Housing)		
Carrier Ass'y (Magnet+Carrier)		
Full Ass'y (Damper Bonding 4point)		



3. 적용시 개선 효과(Process Innovation)

3-1) 품질개선 : 사출물 열변형 개선(경화율 99% 도달시간 기존 EICT 대비 50% 단축)

3-2) 생산성 향상 : 경화시간 최소 50% 개선(NIR 컨베이어 시 80% 이상)

3-3)소모품 및 Jig 절감비용 : 1.50억 (1.0억 + 0.5(Proposal Adhesive))

-.Jig 설계 제작비용 : 100set * 70,000 = 8.4백만원

-.합리적 Adhesive 단가 책정으로 인한 구매 효과 : $50,000/년(15%)

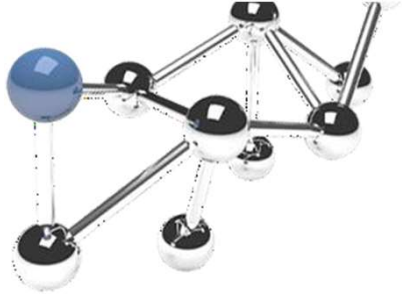
3-4)Adhesive 유수명 증가로 인한 생산성 향상(기존 72hr → 7일)

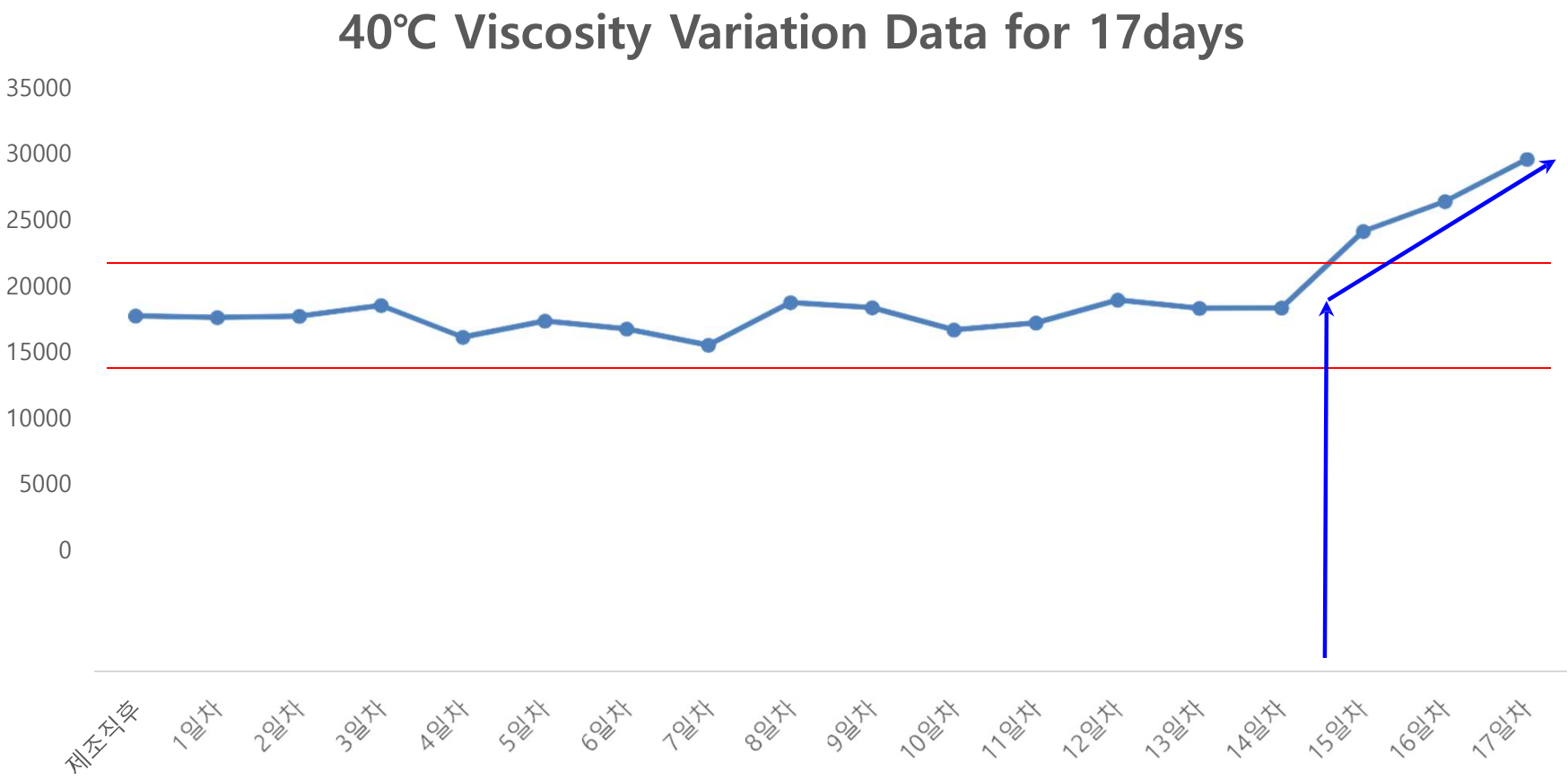
-.Jet Nozzle 교체 주기 및 Cleaning 주기 개선으로 PM시간 절약

-.10cc → 30cc 교체시 설비 Setup 시간 60% 개선

▣ Viscosity Variation Data Oven 40℃_YU-ET2104J

-.Stability Test for Jet Machine Temperature (Syringe 40℃ for 18days in Oven Chamber)





→일자별 Viscosity 변화가 장비 오차 내에 존재하며, 15일차 부터 점도 상승이 일어남.

▣ Result of Jet Dispenser Test_YU-ET2104J

-.Status of Nozzle Contamination

After 1day
1hr Jet Shot → 24hr 방치후

After 3days
1hr Jet Shot → 24hr 방치후

After 7days
1hr Jet Shot → 24hr 방치후

1.Nozzle Temperature : 35℃
2.Nozzle Size : 150um
3.Jet Machine Maker : Vermes Jet Machine

THANK YOU