

Product Introduction : Shin-A T&C



SHIN-A T&C



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Epoxy Resins

Photocure Oligomers, Monomers, and Solution

New Business Development(Including MCCL)

EMC and Related Materials Introduction



Epoxy Resins

- 1.Flame Retardant Epoxy resin/Hardener
- 2.Isocyanate Modified Epoxy Resin
- 3.Low Dk/Df Epoxy Resin
- 4.Low CTE Epoxy Resin
- 5.High Heat Resistance Epoxy Resin
- 6.FCCL Epoxy Resin
- 7.High Purity Epoxy Resin
- 8.Crystalline Epoxy Resin
- 9.Phenoxy



1.Flame Retardant Epoxy resin/Hardener:

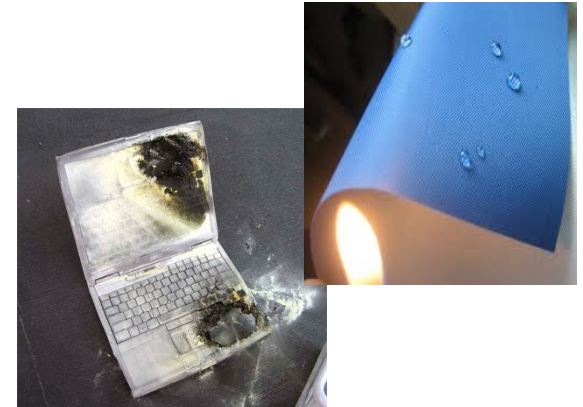
*The demand of Non-halogen Flame Retardants is increased with on-going debate on the environmental effect of Brominated Flame Retardants (BFRs). Shin-A T&C's Non-halogen Flame Retardant Epoxy and Hardener has high thermal resistance, good dimensional stability, excellent electrical and mechanical properties.

** Customer :
DOOSAN, EMC, NANYA, SHENGYI

Application

- CCL(Copper Clad Laminate)
- FCCL(Flexible Copper Clad Laminate)
- Adhesives
- IC Substrates
- Build up Laminate Boards
- Advanced Composite Materials

SHIN-A Line Up	SEN Series	DOPO and DOPO Modified Epoxy Resin
	LC-950 Series	Phosphorous Modified Hardener



2.Isocyanate Modified Epoxy Resin:

* Isocyanate Modified Epoxy Resin has tough matrix with High Tg derived from their special molecular structure, which performance would be suitable for composite materials, especially CCL.♪

** Customer :
ITEQ, EMC, SHANGHAI NANYA, SHENGYI
VENTEC, KINGBOARD♪

Application♪

- CCL(Copper Clad Laminate)
- FCCL(Flexible Copper Clad Laminate)
- Adhesives
- IC Substrates
- Build up Laminate Boards
- Advanced Composite Materials♪

SHIN-A Line Up♪	SEB Series♪	Br Type Isocyanate Modified Epoxy Resin
	SEC Series♪	Br Free Isocyanate Modified Hardener♪



Crack



3.Low Dk/Df Epoxy Resin:

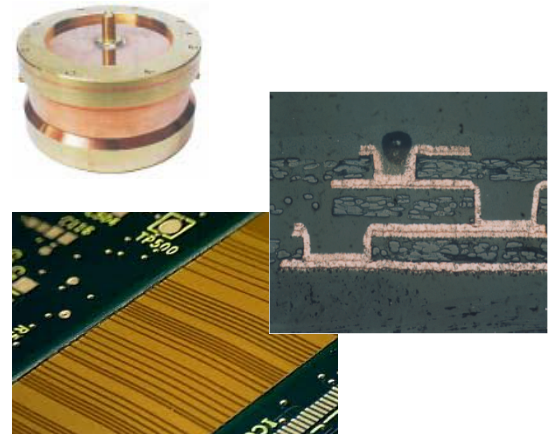
*With the rapid development of advanced electrical devices, Epoxy resin should have improved physical, mechanical, thermal properties,so our product has good thermal stability, low dielectric constant and dissipation factor.

** Customer :
EMC, NANYA, SHENGYI, SHANGHAI NANYA

Application♪

- CCL(Copper Clad Laminate)
- FCCL(Flexible Copper Clad Laminate)
- Semiconductor Adhesives
- IC Substrates
- Build up Laminate Boards
- Advanced Composite Materials♪

SHIN-A Line Up♪	SE-5000♪	Biphenyl Type♪
	XEV-3409♪	DCPD Type♪
	XEV-1170♪	Bisphenol Z Type♪
	XEV-3810♪	O-Cyclophenyl Type♪
	XEV-3900♪	Bisphenol M Type♪



4.Low CTE Epoxy Resin:

*Low CTE Epoxy Resin is special Epoxy resin, It has good adhesion strength, high refractive index, good heat stability.

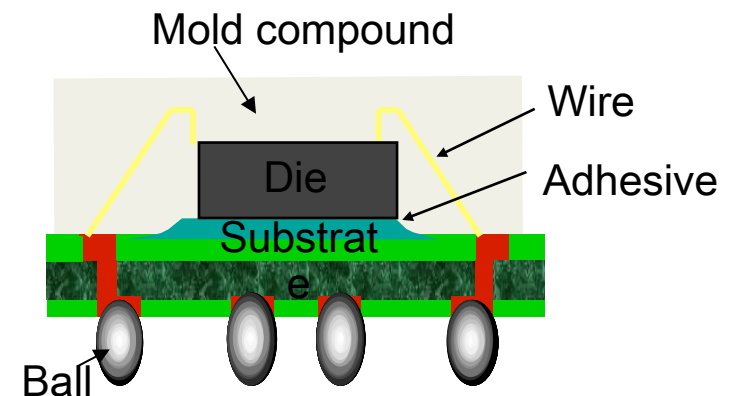
** Customer : EMC, NANYA, SHENGYI



Application

- CCL(Copper Clad Laminate)
- FCCL(Flexible Copper Clad Laminate)
- Adhesives
- IC Substrates
- Build up Laminate Boards
- Advanced Composite Materials

SHIN-A Line Up	SE-80	Naphthalene Type
	SE-90	Naphthalene Type



5.High Heat Resistance Epoxy Resin:

*Shin-A's Special Novolac Epoxy and Hardener show the outstanding Heat Resistance, Chemical and mechanical properties.

** Customer :

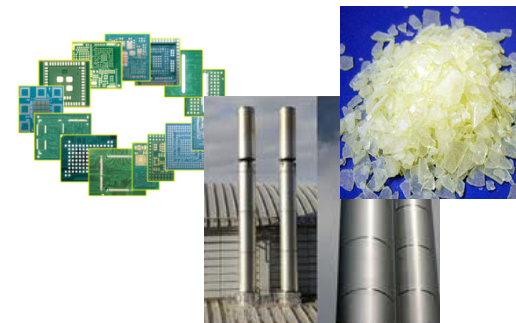
EMC, NANYA, SHENGYI, KINGBOARD



Application

- CCL(Copper Clad Laminate)
- FCCL(Flexible Copper Clad Laminate)
- Adhesives
- IC Substrates
- Build up Laminate Boards
- Advanced Composite Materials

SHIN-A Line Up	SCT-150	Trisphenylmethane Novolac Epoxy
	SEB-400M80	Bisphenol A Novolac Epoxy
	SEF-600M80	Bisphenol F Novolac Epoxy
	SCT-120	Trisphenylmethane Novolac Hardener
	SHV-2990	Xylok Hardener



6.FCCL Epoxy Resin:

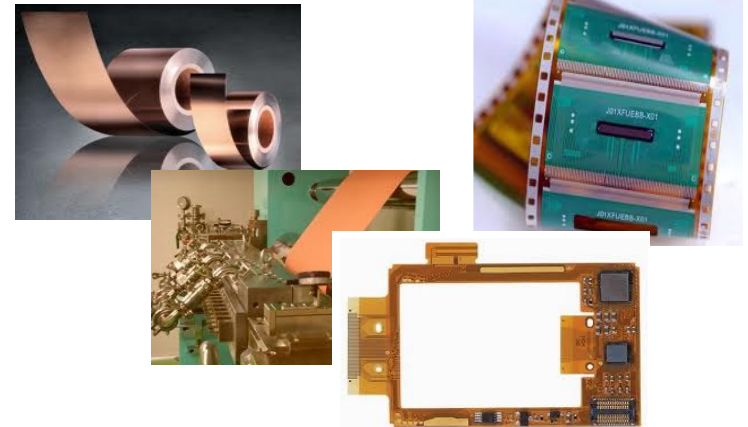
*FCCL Epoxy Resin has advantageous characteristics of good adhesion strength, excellent heat and chemical resistance because of its multi-functional groups in one molecule fully cross-linked. Therefore, it has excellent physical properties .

** Customer :
Hanwha L&C, Doosan Electronics, Innox, Toray Saehan, etc.

Application

- Semiconductor Encapsulants
- Coatings
- Adhesives
- Insulation Films
- Build up Laminate Boards
- Advanced Composite Materials

SHIN-A Line Up	SPE-166	BPF Novolac Epoxy
	XSCG-1001	One Packing Type



7.High Purity Epoxy Resin:

*High Purity Epoxy Resin is a high purity type liquid Epoxy Resin derived from Bisphenol-A. Especially, it has low viscosity and low impurities content like Hy-Cl & T-Cl comparing with general BPA type epoxy resins.

** Customer : Cheil Industries, Henkel, 3M, Samsung Electro-Mechanics, Hanwha L&C, etc ♪
♪

Application ♪

- Semiconductor Encapsulants
- Coatings
- Adhesives
- Insulation Films
- Build up Laminate Boards
- Advanced Composite Materials ♪

SHIN-A Line Up ♪	SE-187 series ♪	High Purity ♪
	SE-300P ♪	Amino Phenol Type ♪
	SE-80P ♪	Naphthalene Epoxy ♪
	SE-170P ♪	BPF Epoxy ♪



8. Crystalline Epoxy Resin:

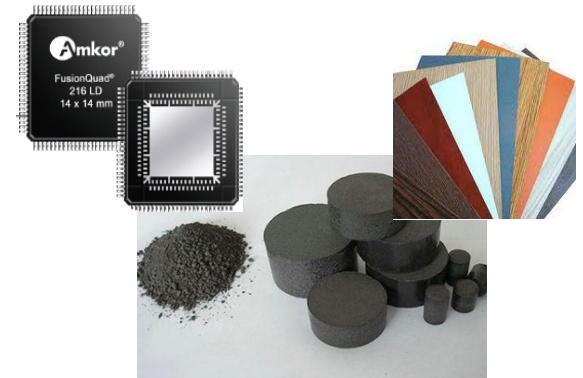
*Crystalline Epoxy Resin is special Epoxy resin, It has good adhesion strength, high Refractive index, and High thermal conductivity.

**Customer : Cheil Industries, Samsung Electro-Mechanics, LG Innotek, Henkel, Eternal, Panasonic, AUO, Miwon, etc.♪

Application ♪

- Epoxy molding compound (EMC)
- Semiconductor Adhesives
- Prism sheet coatings
- Photocure Industrial Coatings♪

SHIN-A Line Up♪	SE-500♪	Biphenyl Epoxy♪
	SE-555♪	Biphenyl Epoxy♪
	SE-650♪	Sulfuric Epoxy♪
	SEF-1700♪	BPF Epoxy♪
	SE-400H♪	Biphenyl Epoxy♪
	SE-450H♪	Biphenyl Epoxy♪



9. Phenoxy:

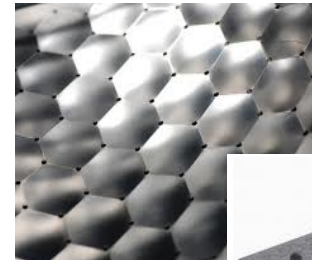
*Phenoxy is an unmodified Bisphenol-A type solid Epoxy Resin designed for use in high performance one-package baking finishes. Coatings based on the resin produce films with outstanding flexibility and good adhesion as well as good chemical resistance. Particularly, MEK as solvent.

**Customer : Hankook Carbon, Samhwa paint, LG Hausys, Innox, Doosan Electronics, Toray Saehan, etc ♪

Application_♪

- Drum Linings
- Can Coatings
- Wire Enamels_♪

SHIN-A Line Up_♪	SEP-400X40_♪	BPA Epoxy_♪
	SEP-600X40_♪	BPA Epoxy_♪
	SPP-300M40_♪	BPA Epoxy_♪



PhotoCure(UV Cure) Materials

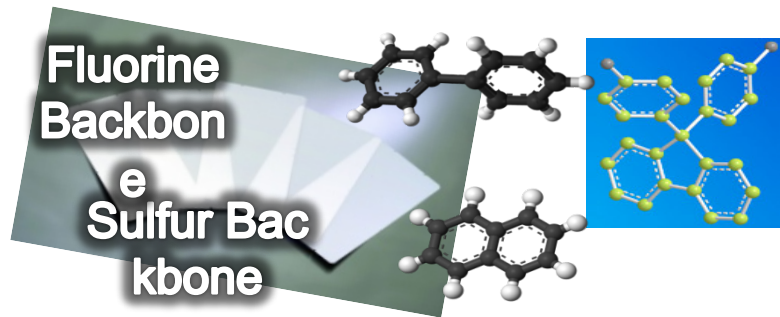
- 1.Epoxy Acrylate
- 2.Urethane Acrylate
- 3.Acryl-Polymer (Solution Polymerization)
- 4.Acryl-Polymer (Emulsion Polymerization)
- 5.Coating Resin for Prism Sheet♪
- 6.Coating Resin for Diffuser / Microlens Sheet
- 7.Coating Resin for Reflector / Hard Coating
- 8.Coating Resin for Cover Plastics (9H)♪



1.Epoxy Acrylate ♪

➤ Low & High Refractive Index Epoxy-Acrylate

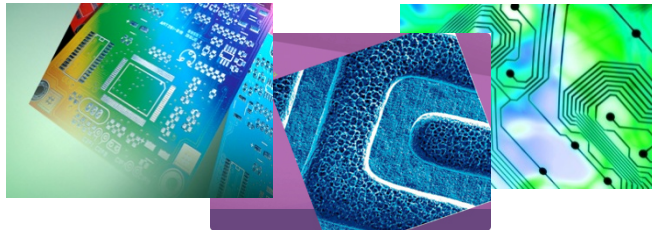
Epoxy-acrylate resin for Display material and Eletronic material is coated by Prism sheet, Diffuser sheet, Anti – Reflection Film, It has Optical properties with High / Low Refractive Index



Group♪	Product♪	Refractive Index♪	Viscosity cps at 25℃♪
Low RI Type♪	SFA-300♪	1.401♪	150♪
	SEA-HE100♪	1.499♪	250,000♪
High RI Type♪	SUO-2001♪	1.573♪	2,000♪
	SEA-500♪	1.582♪	10,000♪
	SEA-650♪	1.585♪	40,000 (40℃)♪
	SEA-820♪	1.605♪	Semi-Solid♪
	SEA-B2304♪	1.612♪	15,000 (40℃)♪

➤ Alkali-Developable Epoxy-Acrylate : PCB Ink, Photoresist

PCB用 Ink, Photo-Resist用 Acid modified Epoxy-Acrylate : Chemical Etching Resist, Solder Resist Resin



Product♪	Viscosity (cps at 25℃)♪	Acid Value♪
JEA-1080♪	23,000♪	75♪
JEA-1080PM♪	11,000♪	85♪
JEA-1090PM♪	25,000♪	85♪

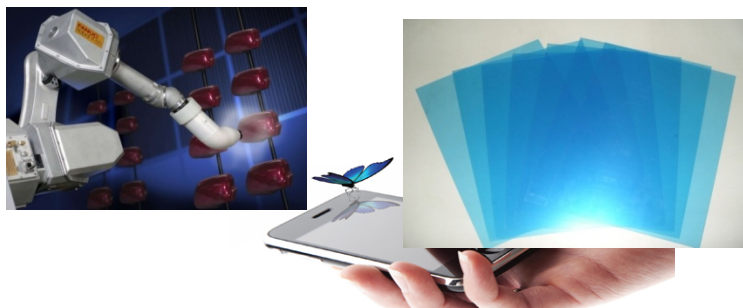
➤ Main Customers : Cheil Industry, Dongwoo Fine Chemical

2.Urethane Acrylate ♪

➤ Hard Type Urethane-Acrylate

Hard Coating for Plastic, Optical Film Multi-Functional Urethane-Acrylate (Fucntionality $\geq 3E$)

A)

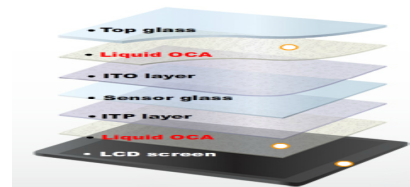


Group♪	Product♪	Viscosity (cps)♪	Functionality♪
Hard type♪	SUO-7620♪	35,000 (25℃)♪	6♪
	SUO-7910♪	10,000 (60℃)♪	9♪
	SUO-1700♪	35,000 (40℃)♪	10♪
Medium, Soft Type♪	SUO-1020♪	40,000♪	2♪
	SUO-H7000♪	70,000♪	2♪
	SUO-300♪	35,000♪	3♪
	UA-222♪	6,500♪	2♪
Low Tg Low Hardness Adhesives♪	SUO-2172♪	90,000♪	2♪
	SUO-2152♪	50,000♪	1♪
	SUO-2171♪	80,000♪	1♪

➤ Main Customers : 3M, LG Hausys, Dongwoo Finechem, Ubright♪

➤ Medium, Soft, Elastic Type Urethane-Acrylate

Adhesive, Flexible Coating, Ink, OCA Film Mono & Di Functional Urethane-Acrylate



3.Acryl-Polymer (Solution Polymerization) ♪



4.Acryl-Polymer (Emulsion Polymerization) ♪



*Backlight unit:♪

1. Formulation for Back Light Unit Films

1) Prism Sheet : Normal type , Self-Healing type, UV Curable

- Normal Type ; High Refractive Index
- Self-Healing Type ; High Refractive Index+self-healing

2) Diffuser Sheet : Thermal Curable

- Low Shrinkage, Low Cost

3) Reflector Sheet : UV Curable

- Low Cost/ Low Shrinkage Resin

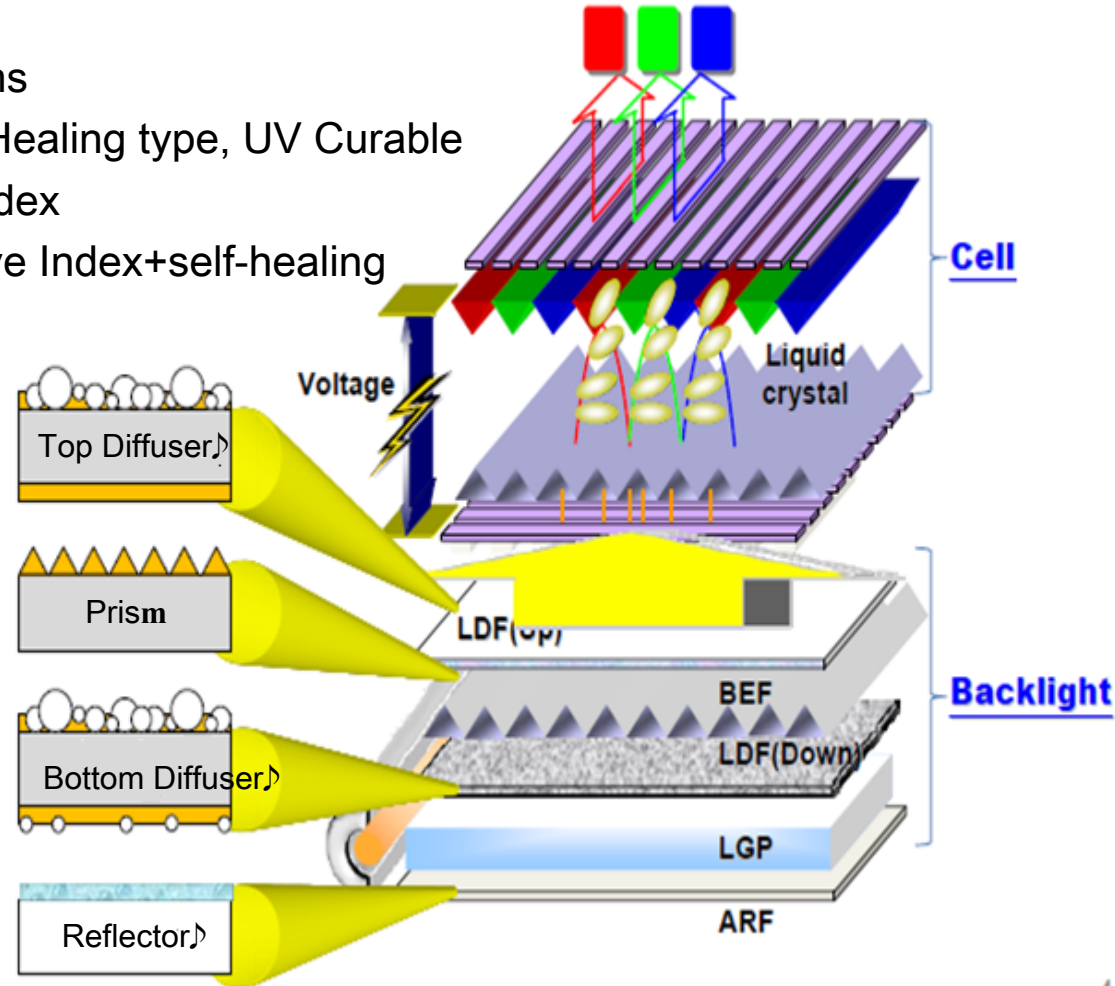
2. Formulation for Hard Coating

1) Normal Clear Hard Coating

- Substrate : PET, PMMA, PC

2) Cover Plastic Film

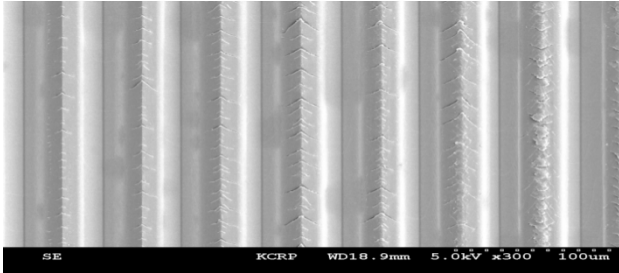
- Pencil Hardness : 9H



5.Coating Resin for Prism Sheet (Solution)♪

➤ Self-Healing type Prism Resin

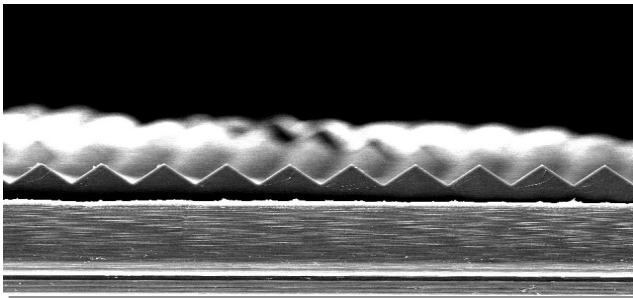
If it happen to scratch on Prism Pattern, the coated prism resin be applicable to heal itself.
it has cost down effect due to remove the protective film.♪



Product♪	RI♪	Viscosity (cps at 25°C)♪	Anti-Scratch♪
NP-S20	1.53	530♪	2000g♪
NP-S50	1.55	1,000♪	1,500g♪
NP-S55	1.56	1,400♪	1,700g♪
NP-S57	1.57	2,500♪	1,000g♪

➤ Normal Type High Refractive Index Prism Resin

This product has High refractive index, so there is effect to go up brightness.



Product♪	RI♪	Viscosity (cps at 25°C)♪	Anti-Scratch♪
SUP-560♪	1.566♪	500♪	-♪
SUP-579♪	1.579♪	1,000♪	100g♪
SUP-593♪	1.593♪	600♪	80g♪

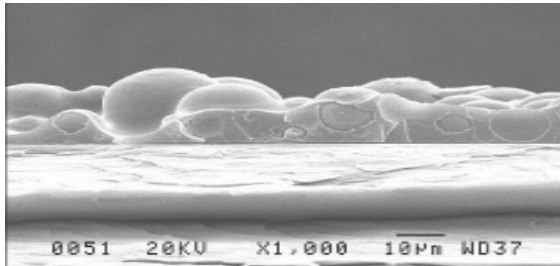
➤ Main Customers : 미래나노텍, 상보, LG 화학, 동우 화인캠 외♪

6.Coating Resin for Diffuser / Microlens Sheet (Solution) ♪

➤ Diffuser Resin

Diffuser resin has a property to diffuse light and to sustain a entire equal brightness . It is good cohesive to bead. Resin flow is good.

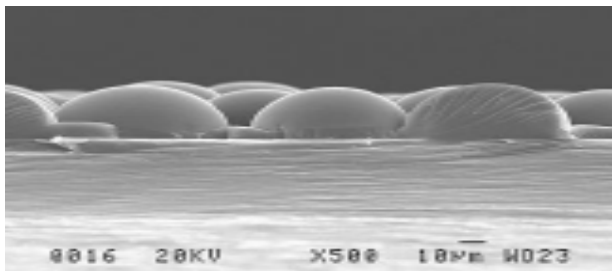
♪



Product♪	RI♪	Viscosity (cps at 25°C)♪
SUD-460	1.46♪	130♪
SUD-470♪	1.47♪	110♪

➤ Micro-Lens Resin

Micro-lens resin has medium optical property between typical Prism and Diffuser, Low viscosity and Low shrinkage. It is applicable to big size TV display.



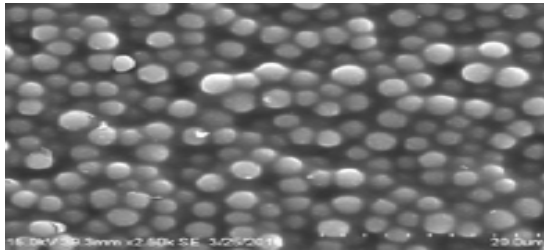
Product♪	RI♪	Viscosity (cps at 25°C)♪
SEM-100♪	1.475♪	250♪
SEM-200♪	1.470♪	-♪

➤ Main Customers : SKC-Hass 외♪

7.Coating Resin for Reflector / Hard Coating(Solution)♪

➤ Reflector Resin

Reflector resin has good dispersity to bead ,good adhesion strength to white pet film and Non-yellowing property . Reflector material is located at LCD BLU back side. Coated reflector resin guide Light into upward path.



Product♪	RI♪	Viscosity (cps at 25°C)♪	Comment
SHR-17MT	1.467♪	10 Max	Heat Curable

➤ Clear Hard Coating Resin

Hard coating resin is coated on pet film which has high hardness (3H) . If It is coated on PMMA , It has super-high hardness(about 6H for pencil Hardness). When it is blended with other resin, it has good Anti-cracking,good protective to LCD display

➤ PC Film用 Hard Coating Resin

Hard coating resin for PC film has good heat stability compared to Pet film, good adhesion to PC film ,good Anti-cracking.



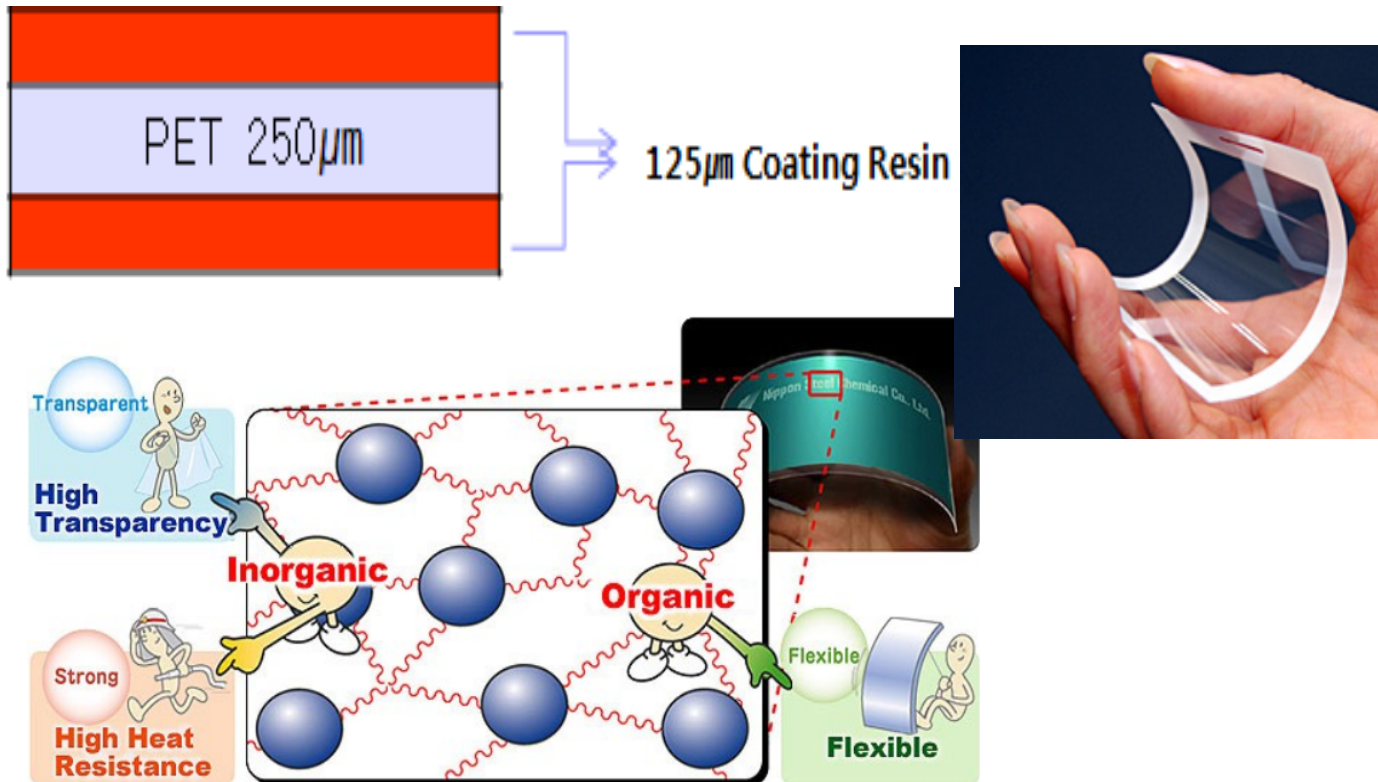
Product♪	Hardness♪	Viscosity (cps at 25°C)♪	Comment♪
SPC-T450	3H♪	10 Max	PET Film
SHC-45TS	3H♪	10 Max	PET Film
SHC-45TM	2H♪	10 Max	PET Film

➤ Main Customers : 지흥, 아이컴포넌트, 대만 외



8.Coating Resin for Cover Plastics (9H)♪

- High hardness 9H Hard Coating Resin (Under development)
cover Plastic Coating resin for alternation of cover glass has super-high hardness, Light weight, ease-handling, cost down, possible application for Flexible Display.



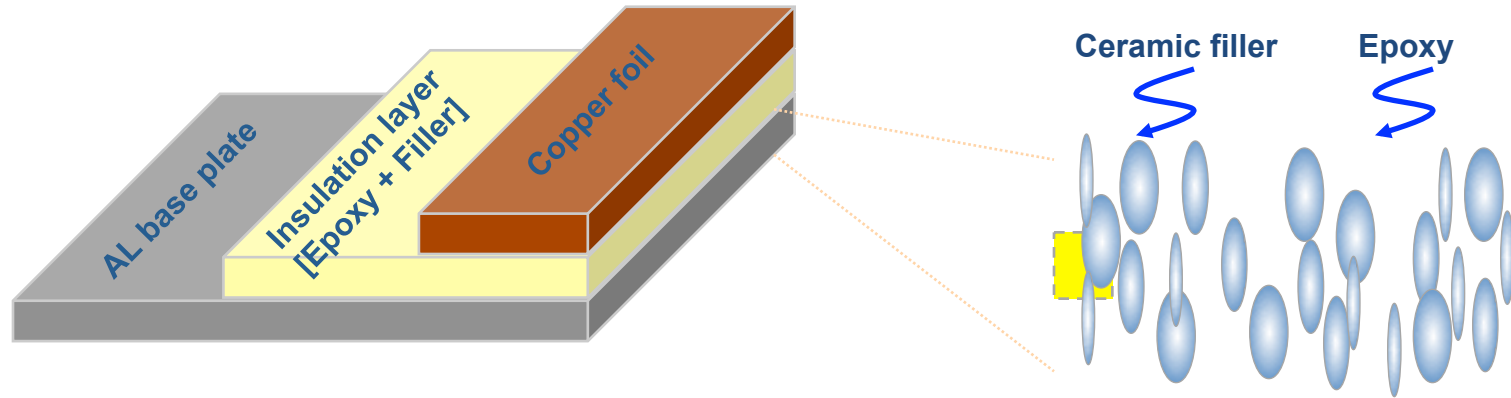
➤ Main Customers : LGD, 일본, 대만 외

4.New Business Development

- 1.Metal CCL
- 2.Composite – Application
- 3.Catalyst / Hardener ♪



1.Metal CCL ♪



1.Technology for Epoxy Insulation Layer

- 1) High Density Epoxy Development (Various Special Epoxy Grade)
- 2) Selection of various ceramic filler
- 3) Formulation Technology♪

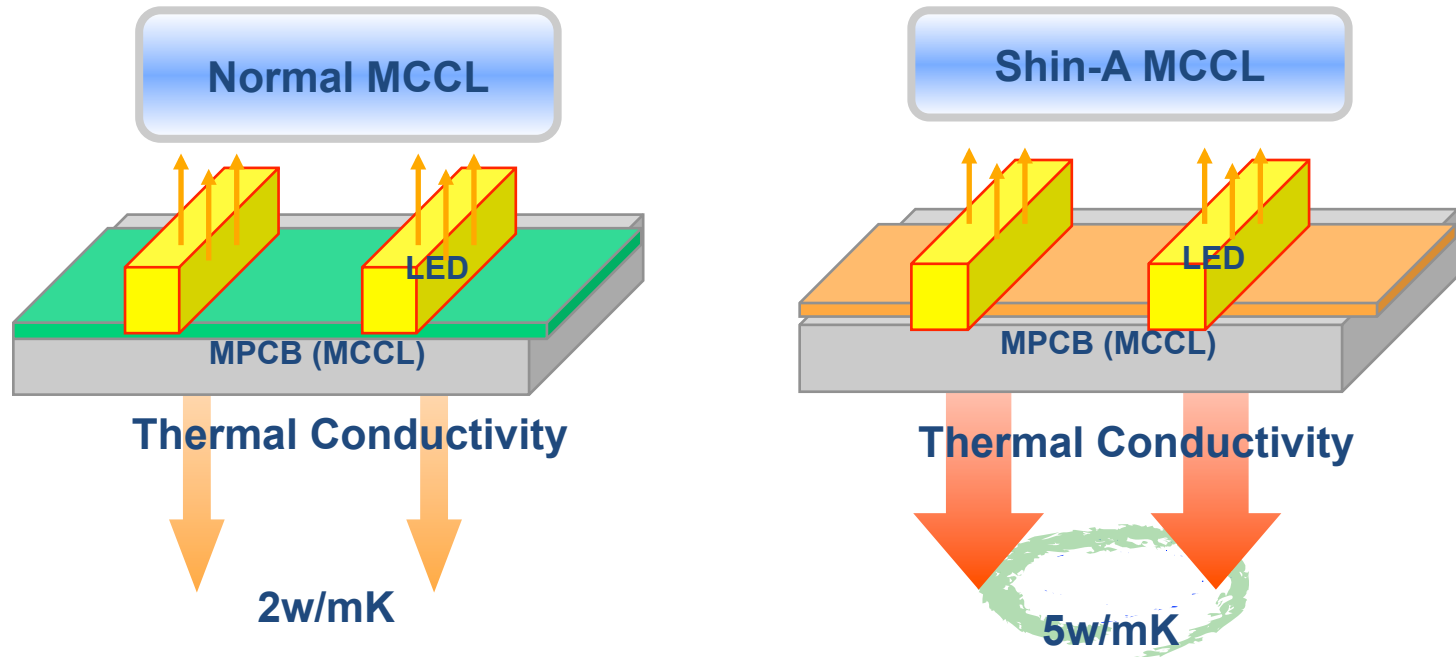
2.Wet & Dry Coating Technology

- 1) Control the thickness for Insulation layer
- 2) Possibility for coating on various substrate

3.Hot Press Technology

- 1) Suitable Press Condition for our Epoxy Insulation Layer♪

1-1. Advantage ♪

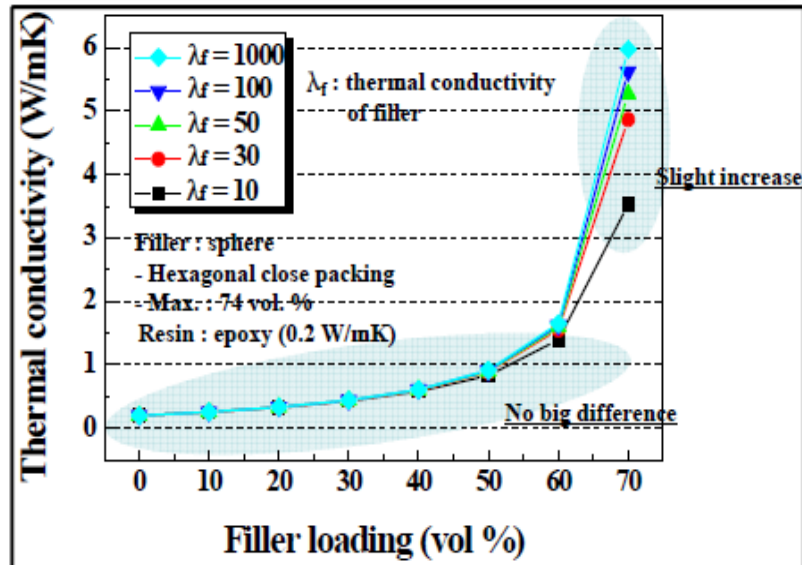


*Shin-A T&C 5w/mK MCCL ♪

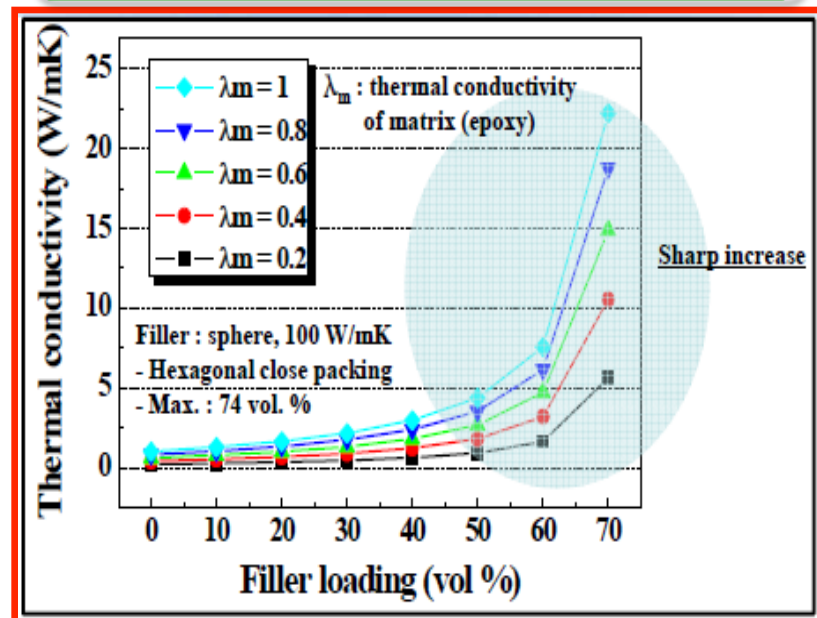
1. Avoid hurting the LED Properties by heat
2. Avoid decreasing the life time of LED by heat
3. Minimizing the LED color shift with high heat conductivity ♪

1-2.Heat Dissipation ♪

The effect of Thermal Conductivity of Filler



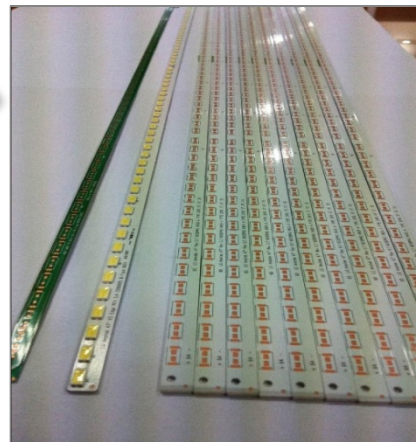
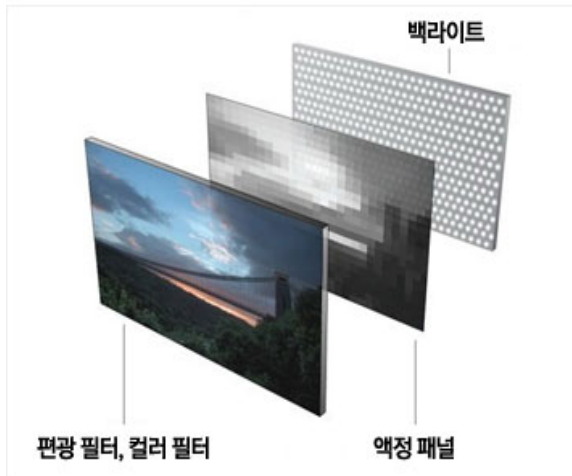
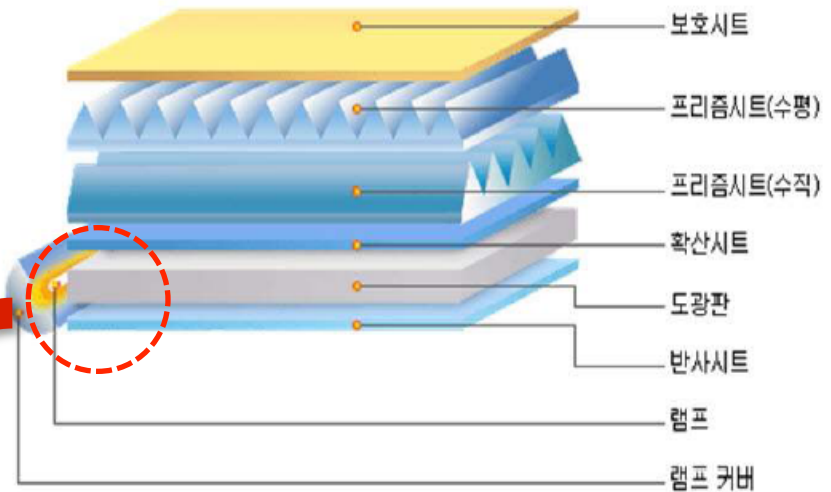
The effect of Thermal Conductivity of Resin



1-3.Application [LCD TV BLU]♪



Model No. : 55/47/42/32 LM6700



2.Composite - Application♪

COMPOSITE

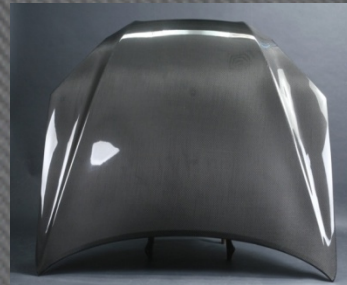
Infusion
Process



Filament Winding
Process



Hand Lay-up
Process

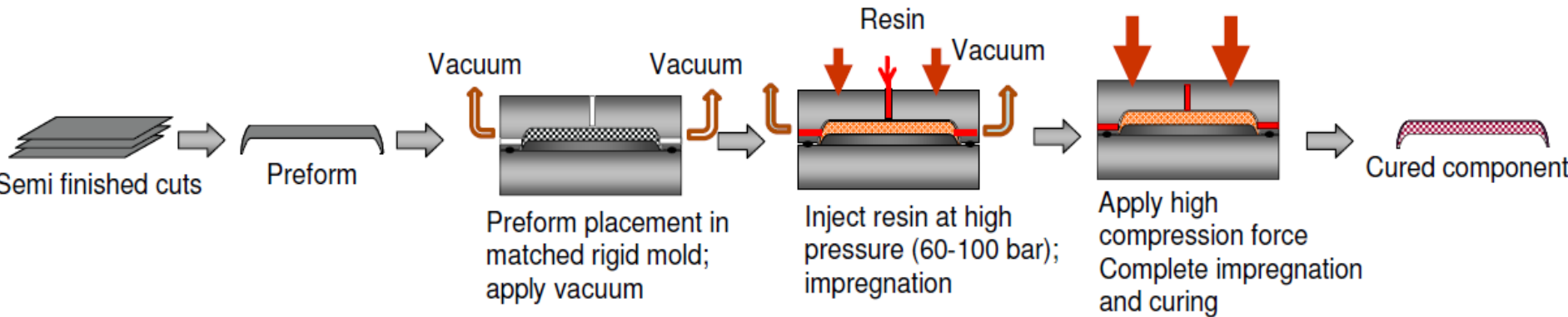


Prepreg
Process



2-1.Composite – Automotive[HP-RTM]

High pressure injection RTM – HP-RTM



Structural Body parts

Underbody structure



Bumper



Side Frame



Roof



Audi R8 Spyder



BMW M6



BMW Project i CityCar



Bild Quelle Internet

Regulations	Measure s	Solutions
CO2 Emissions↓	Light Weight↓	Composite
Fuel Efficiency↓	Part Change	Led Light/High Efficiency Tyre
Depleting Petroleum↓	Alternative Energy↓	Electric Car

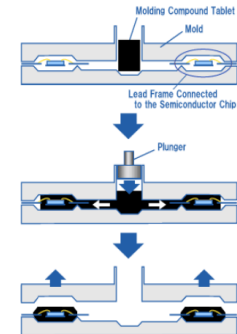
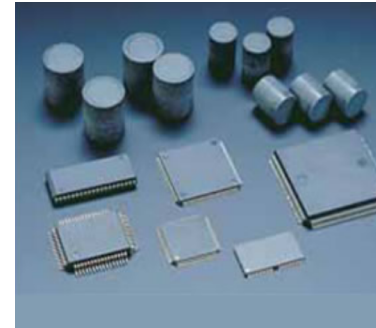


3.Catalyst / Hardener♪

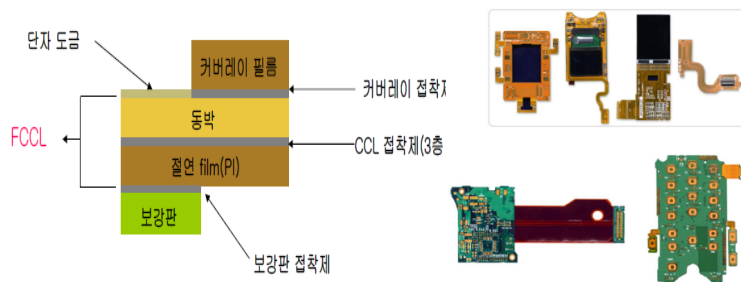


Catalyst for EMC

- SNH-2201, SNH-2202
- Characteristics
 1. 1-component type
 2. Thermal curing agent
 3. Activated curing with long pot life♪
- Application : EMC(epoxy molding compound)



FCCL adhesive Curing agent

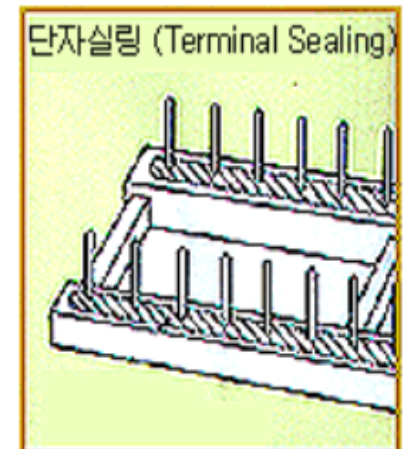
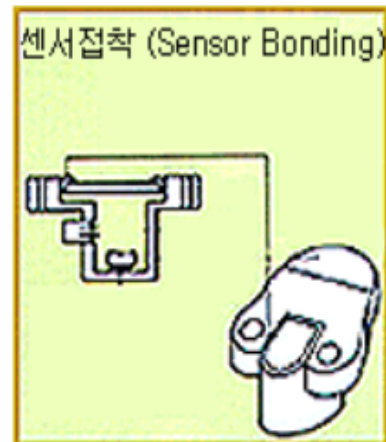


- LC-500 / LC-600
- Characteristics
 1. Low Temperature Curing Coating / Electronics
 2. Liquid type hardener
- Application : FCCL-Peel Strength Extender, Adhesive Film

3-1.Catalyst / Hardener♪

Latent Hardener

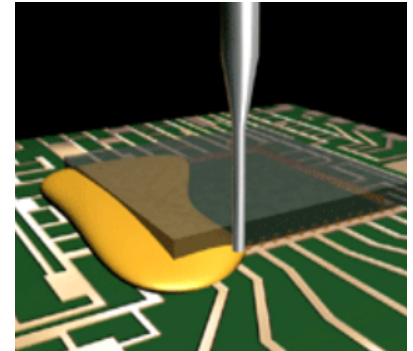
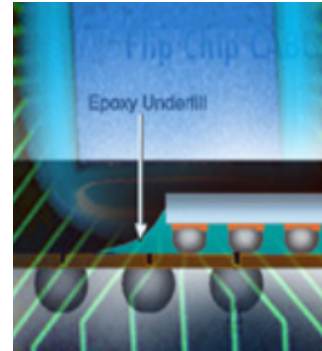
- LC-10(High Temp. Curing 120℃ 이상)
- LC-30(Mid. Temp. Curing 120℃)
- XNH-1201(Low Temp. Curing 100℃)
- Characteristics
 1. 1-component type(Epoxy+Hardener)
 2. Thermal curing agent
 3. Long pot life♪
- Application : Electric material Adhesive, Insulation varnish, Prepregs for fiber



3-2.Catalyst / Hardener♪

Underfill adhesive Curing agent

- LC-800
- Characteristics
 1. Solvent Free Liquid hardener
 2. Good Compatibility with resin
 3. Low Temperature curing♪
- Application : Underfill adhesive



Marine coating

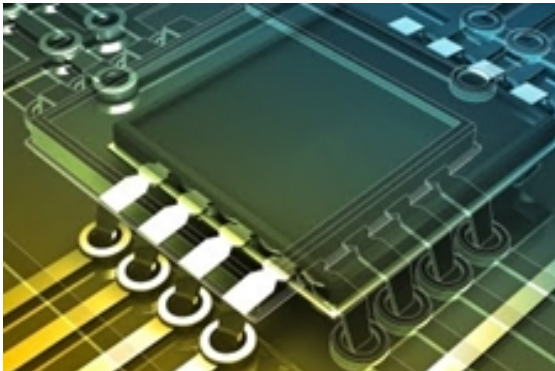


- SHL-0420
- Characteristics
 1. High Solid Epoxy hardener
 2. Good corrosion resistance
 3. Moderate viscosity and Good Flexibility♪
- Application : Marine coating hardener

EMC Epoxy Resin

SHIN-A T&C

April . 2012



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1.Epoxy Resin for EMC

2. The Point at Issue of EMC

3. New Epoxy resin for EMC



1. Epoxy Resin For EMC

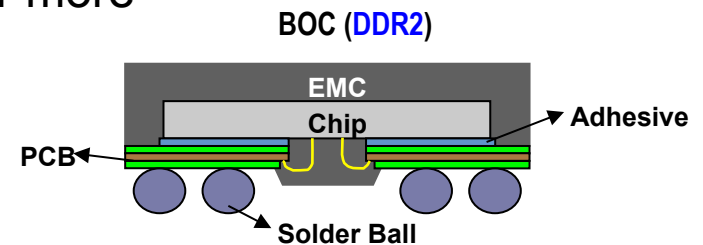


Epoxy Resin For EMC

What is the EMC?

EMC(Epoxy Molding Compound)?

- Protect for the chip from the atmosphere.
- Dielectric property from the atmosphere.
- Thermal emissions in the chip operation.
- Thermosetting Resin Encapsulation for more convenient Board Mounting.



Epoxy Resin For EMC

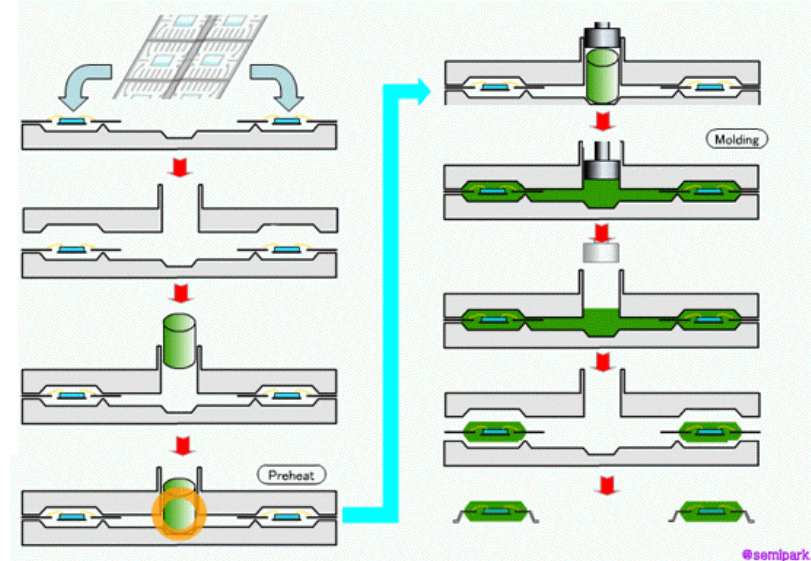
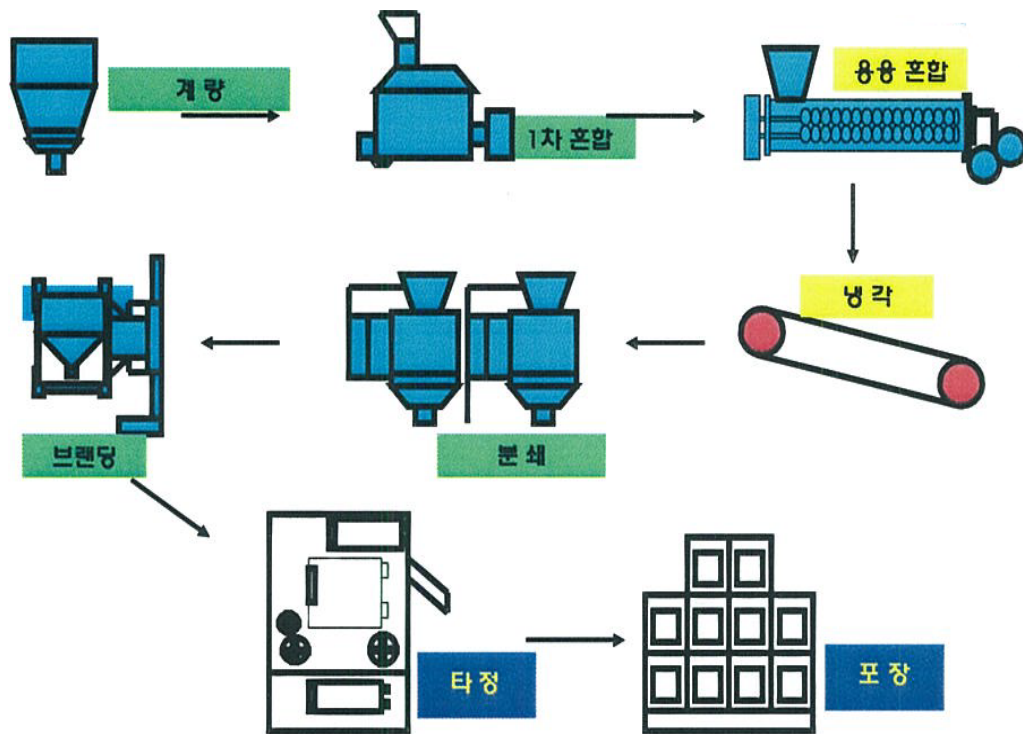
Standard Formulation of EMC

Formulation	Materials	ratio(%)
Epoxy Resin	Novolac, Biphenyl type Epoxy	5~20
Flame retardant Resin	Organic Flame Retardant	<2
Hardener	Phenol novolac, Xylock Resin	5~15
Filler	Improving Strength, Thermal Conductivity and Thermal Expansion Coefficient	60~93
Catalyst	Accelerating Reaction of Epoxy with Hardner	< 1
Coupling agent	Improving Adhesion between Organic and Inorganic Materials.	< 1
Flame Retardant	Inorganic Flame Retardant	0.5~3.0
Additives	Lowering Internal Thermal Stresses	< 5
Release Agent	Releasing Agent for Workability	<1



Epoxy Resin For EMC

EMC Process



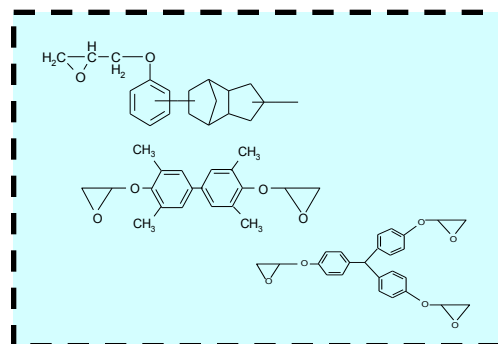
@sempark

2. The Point at Issue of EMC

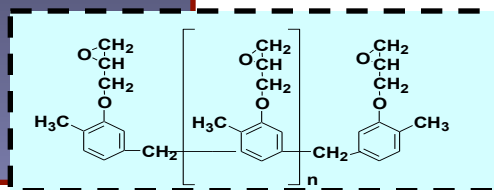


The Point at Issue of EMC

Epoxy Resin Technical trend of EMC



1st Gen.
OCN type

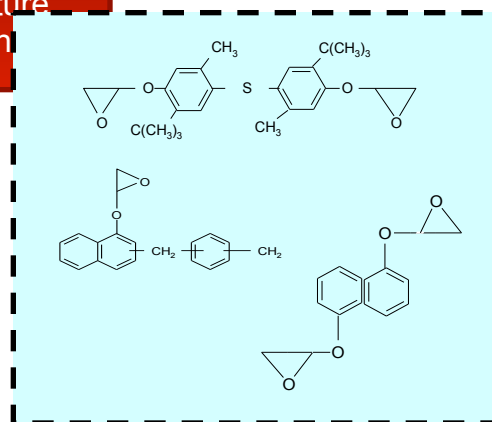


2nd Gen.

High T_g
Low Melting
Viscosity
Low Moisture
Absorption

3rd Gen.

High T_g
Low Melting
Viscosity
Low Moisture
Absorption



4th Gen.

More High T_g
Low CTE
Thermal
Conductivity
Anti-Corrosive

?

The Point at Issue of EMC

01 Low CTE, High Tg

Contraction, Expansion of Epoxy

→ **Cracking of EMC**

200
160
130

200
600 1500

Overcome the
EMC of
Epoxy Resins

**We sell
from the conventional type
to High End Type Epoxies!**

0.2 0.8 1.2

02 Highest Purity

Chloride ion of Epoxy Resin

→ **Gold Wire Corrosive**

03 Thermal Conductivity

Thin Thickness , Small Size Chip

→ **Occurrence High Heat**



3. New Epoxy Resin For EMC

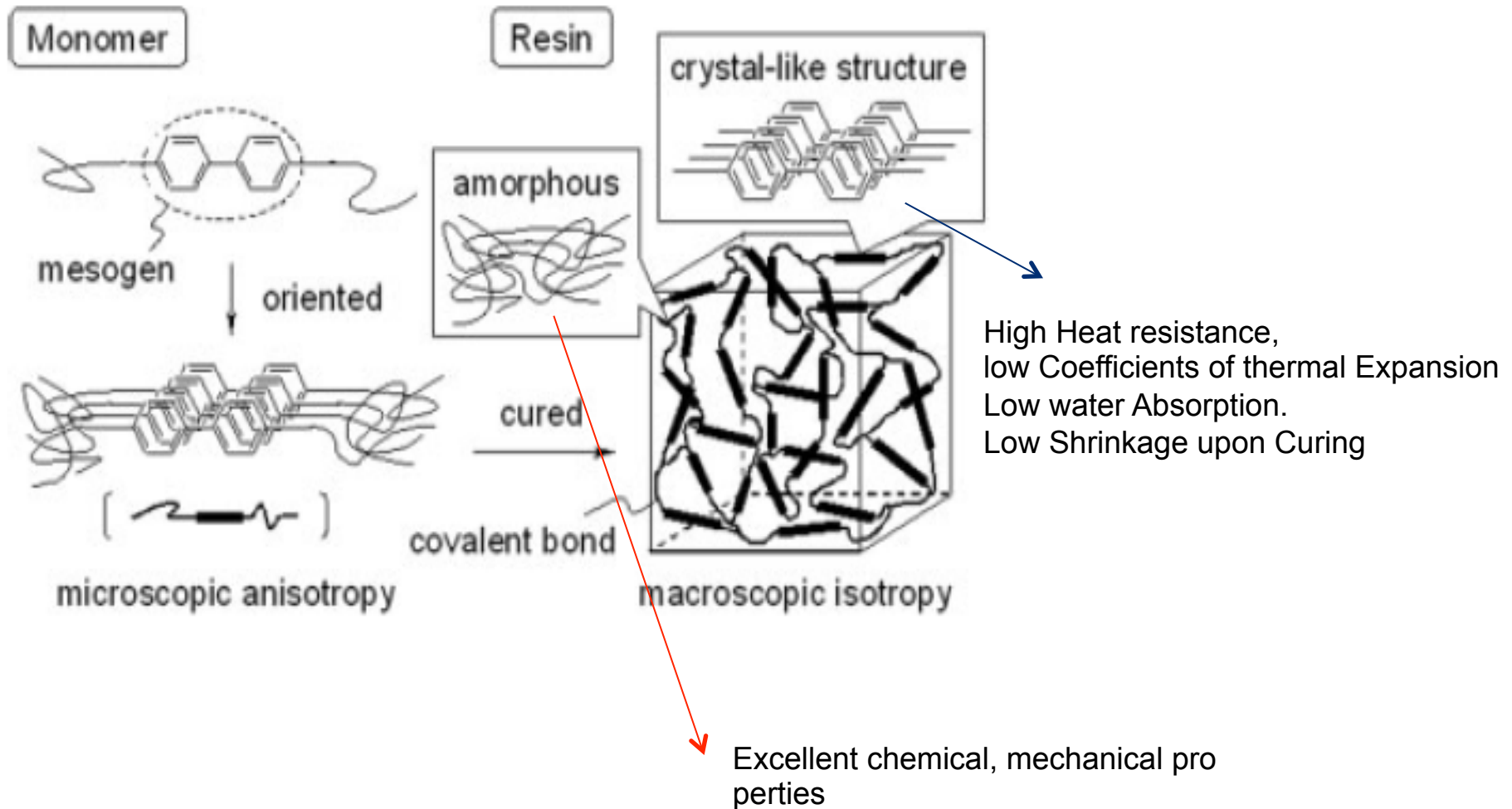
- Thermal Conductivity Epoxy**
- Low Moisture Absorption Epoxy**
- High Purity Epoxy**
- Low CTE Epoxy**
- Low Viscosity Epoxy**
- High Tg Epoxy**



Thermal Conductivity Epoxy



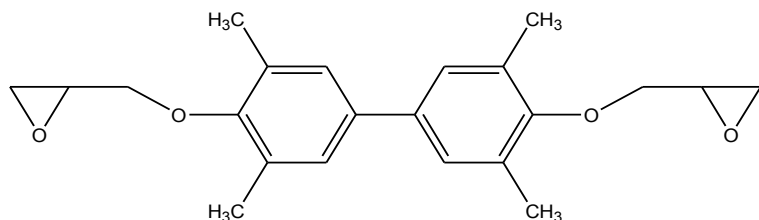
Thermal Conductivity Epoxy



Thermal Conductivity Epoxy

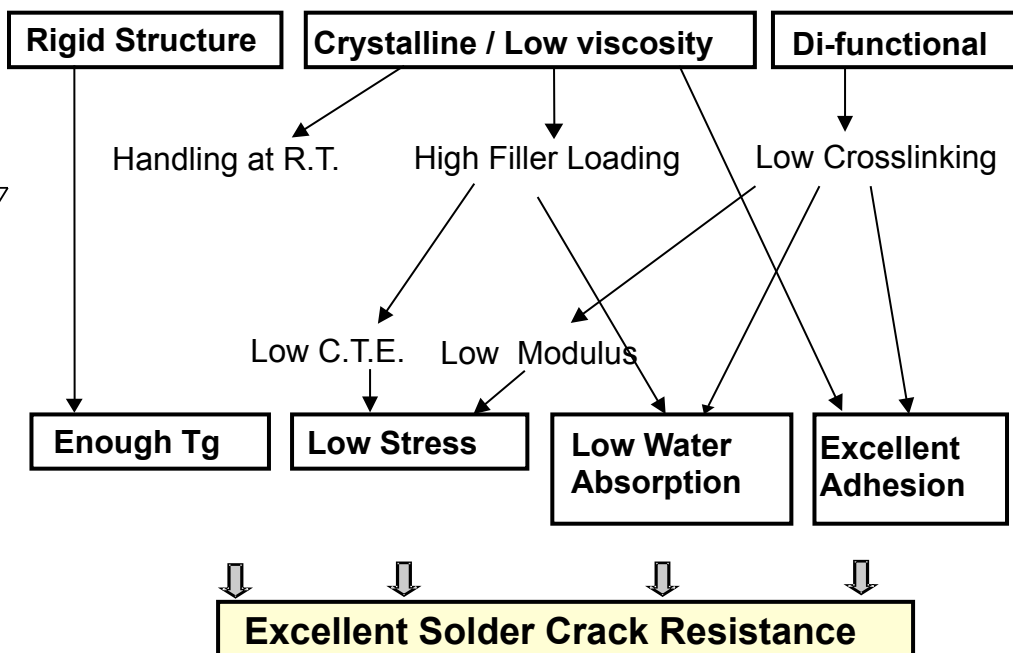
SHIN-A T&C Epoxy Resin

Crystalline Epoxy



SE-400H

- Tetramethylbiphenol Type Epoxy Resin
- High T_g, Good Adhesion properties.
- Low Viscosity (High Loading Filler)



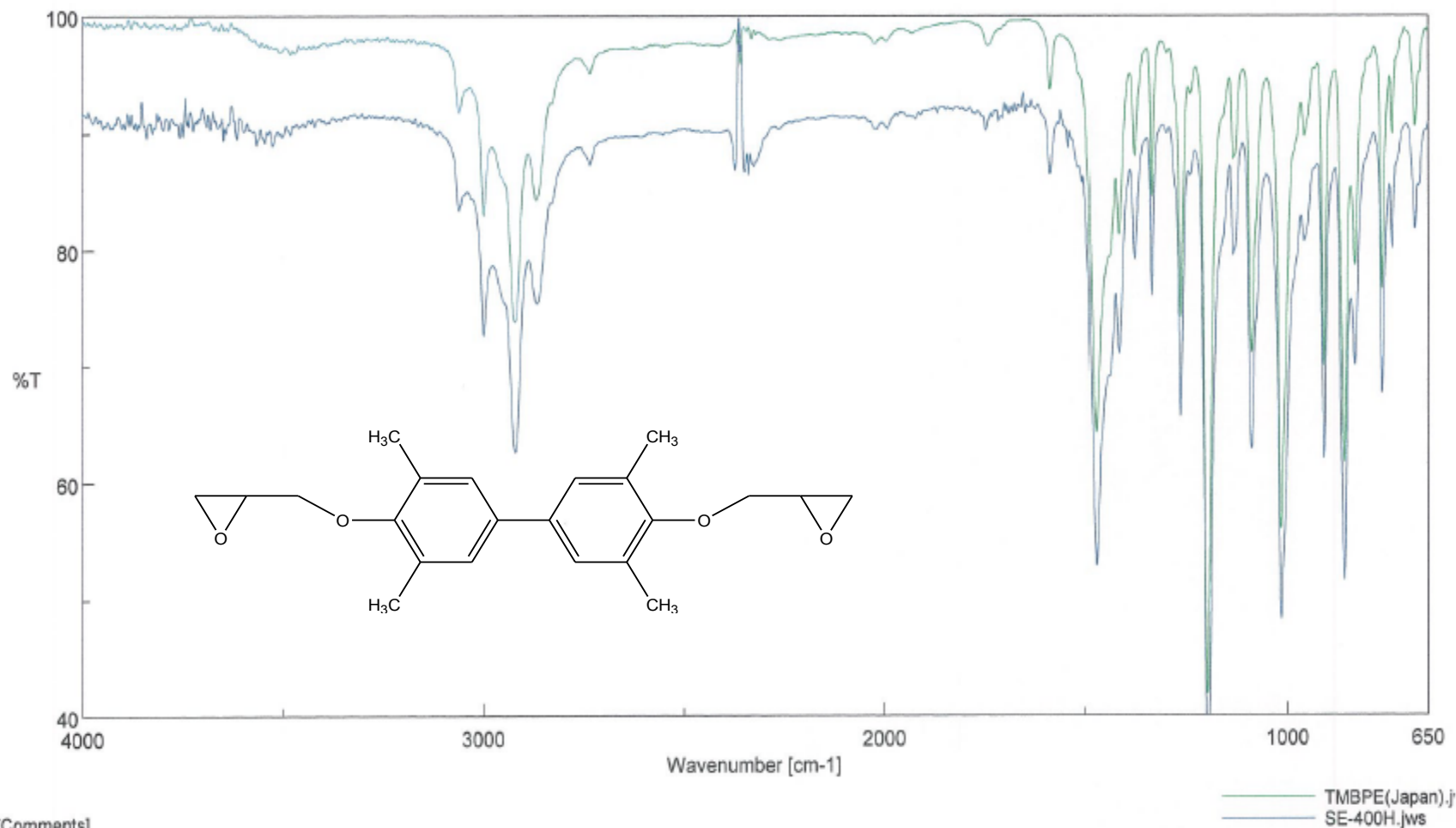
Grade	E.E.W	Hy-Cl	T-Cl	Geltime (170°C)	Tm(DSC)	S.P(B&R)	ICI 150°C	Features
SE-400H	170 - 195	0.05% Max.	0.1% Max.	50 - 80	100-115°C	100-115°C	20cps Max.	TMBP

Geltime Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 170°C



Thermal Conductivity Epoxy

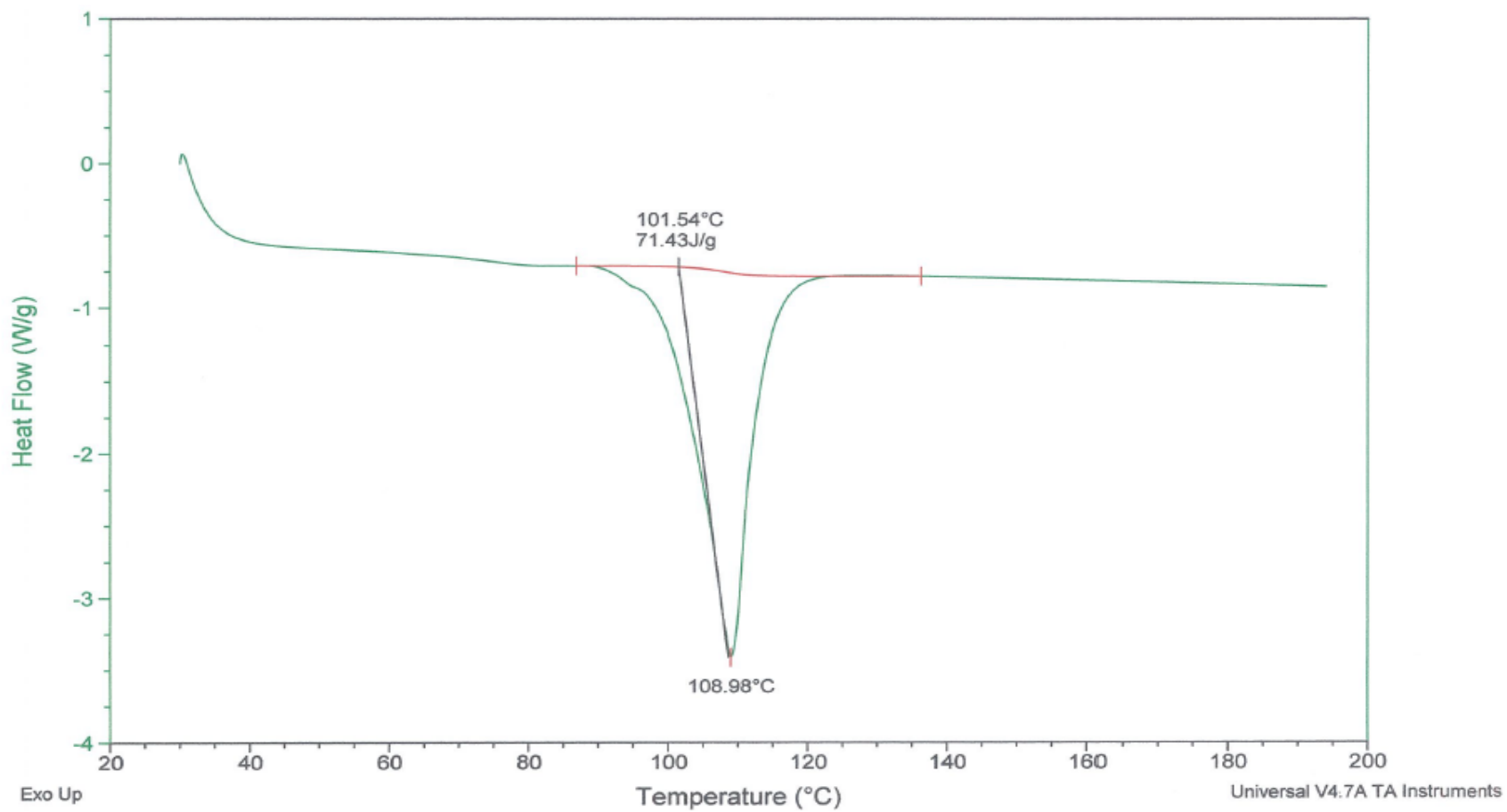
IR CHART (SE-400H)



[Comments]

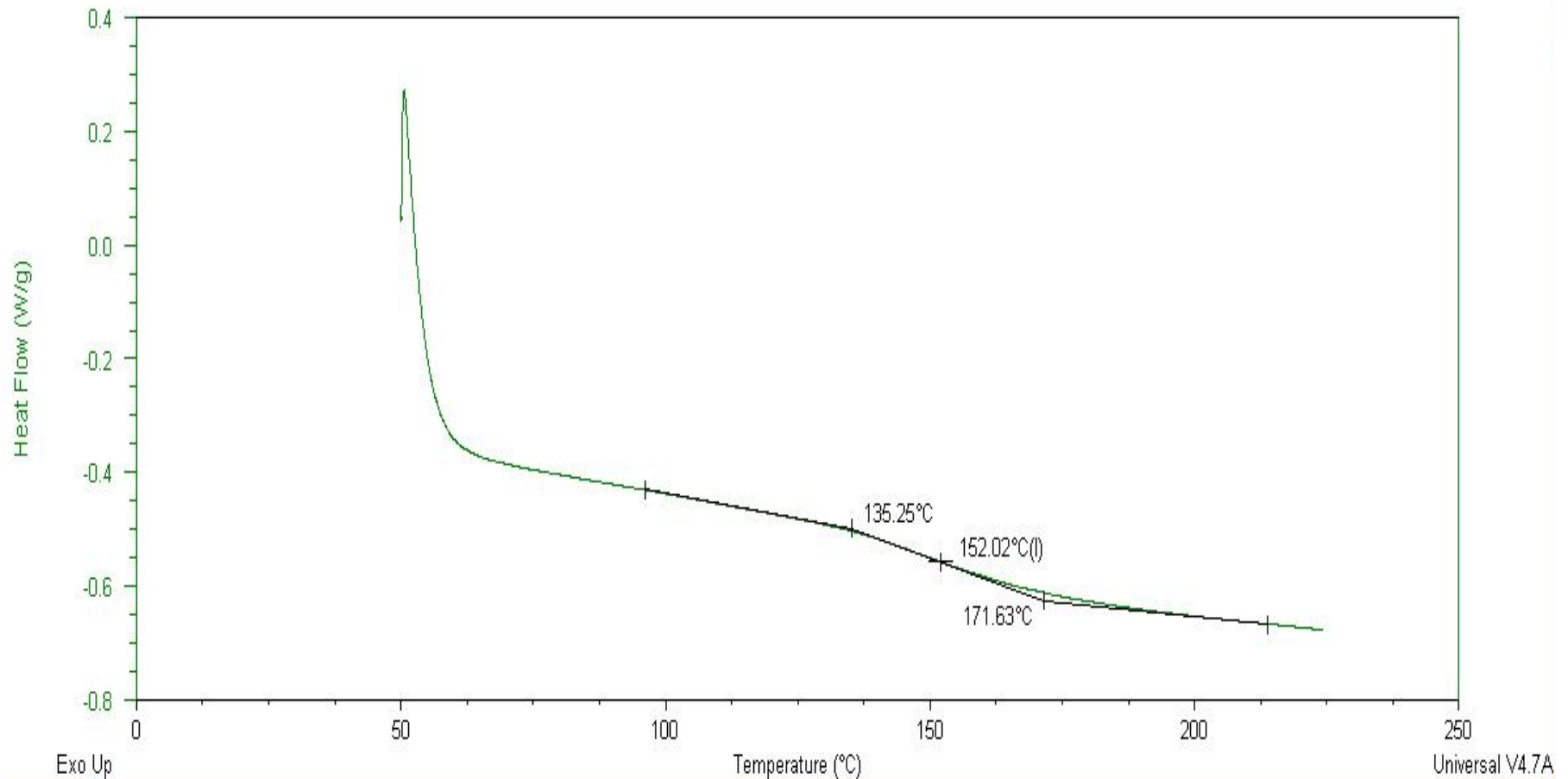
Thermal Conductivity Epoxy

Tm(SE-400H)



Thermal Conductivity Epoxy

Tg(SE-400H) – Reference Data

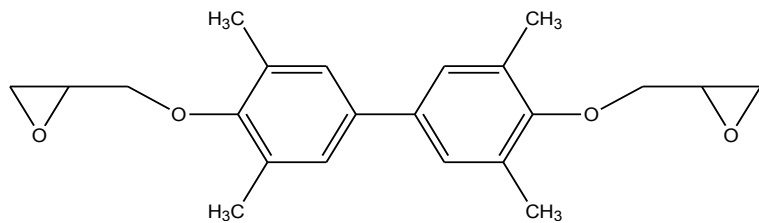


Curing Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 180°C x2hr

Thermal Conductivity Epoxy

SHIN-A T&C Epoxy Resin

Crystalline Epoxy



SE-450H

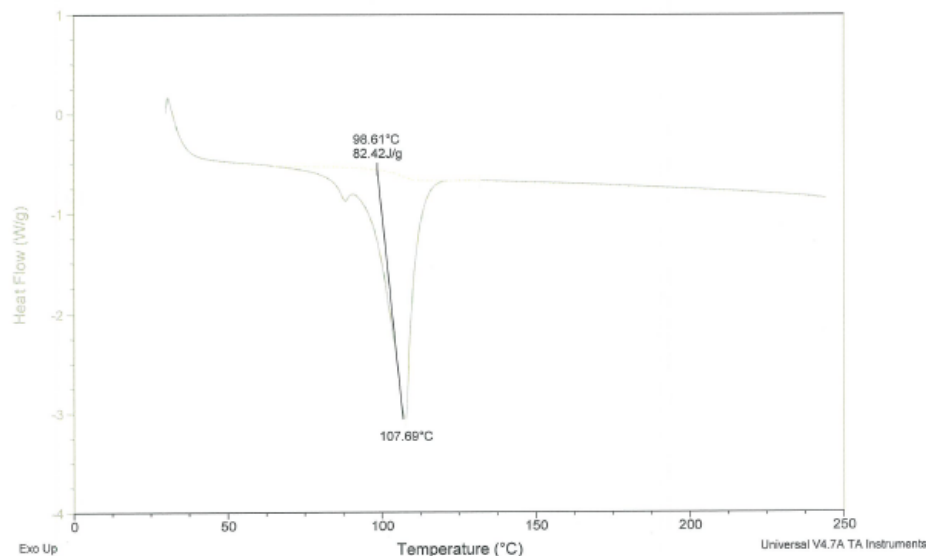
- Tetramethylbiphenol Type Epoxy Resin
- High T_g, Good Adhesion properties.
- Very Low Viscosity (High Filler Loading)

Sample: SE-450H(3%)
Size: 6.7000 mg
Method: general

DSC

File: C:\TA\Data\DSC\에픽시 1합\SE-450H(3%).001

Run Date: 20-Feb-2012 15:20
Instrument: DSC Q200 V24.7 Build 119



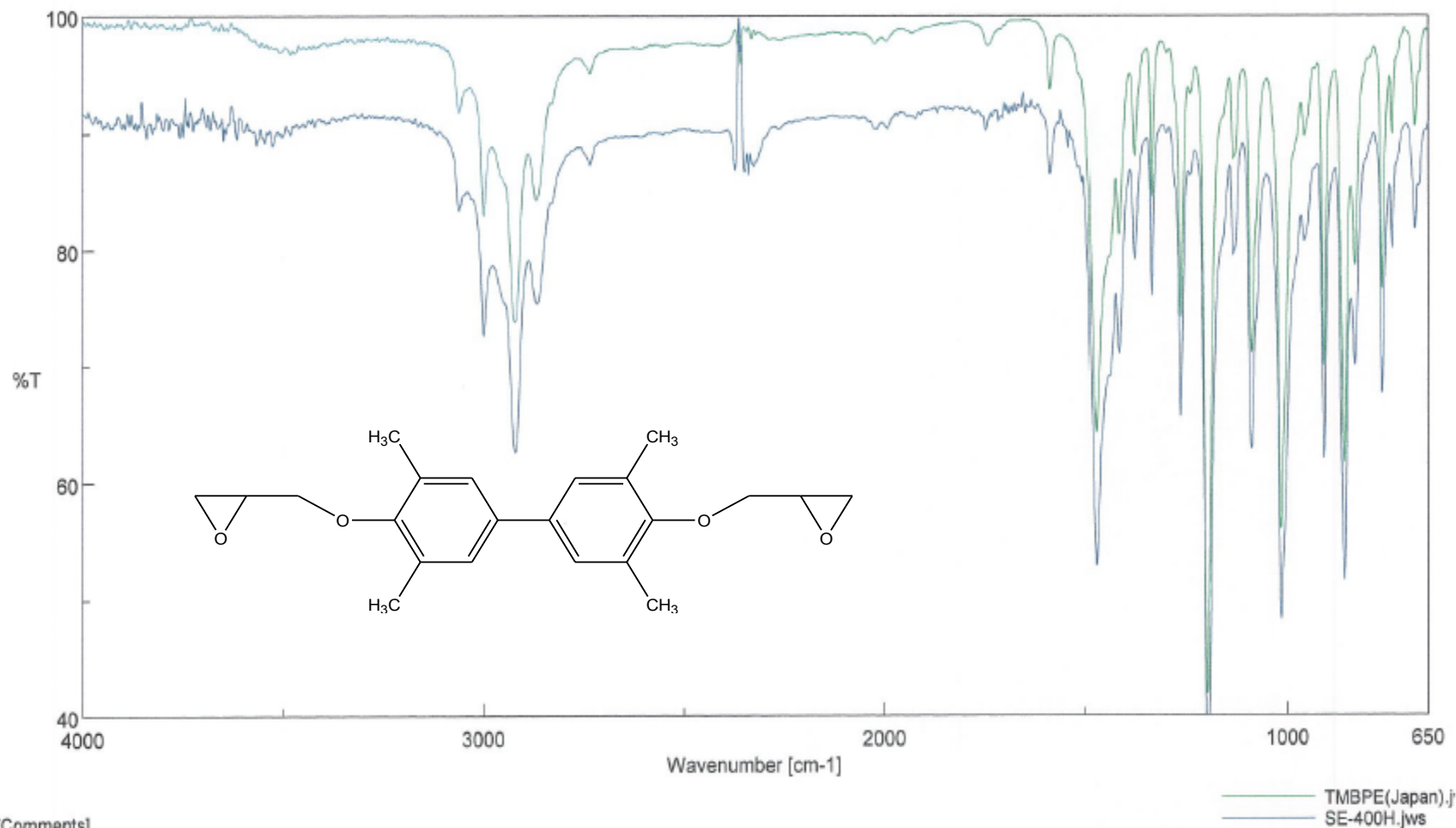
Grade	E.E.W	Hy-Cl	T-Cl	Geltime(170°C)	Tm(DSC)	S.P(B&R)	ICI 150°C	Features
SE-450H	170-195	0.05% Max.	0.1% Max.	60-80	100-115°C	100-115°C	20cps Max.	TMBP

Geltime Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 170°C



Thermal Conductivity Epoxy

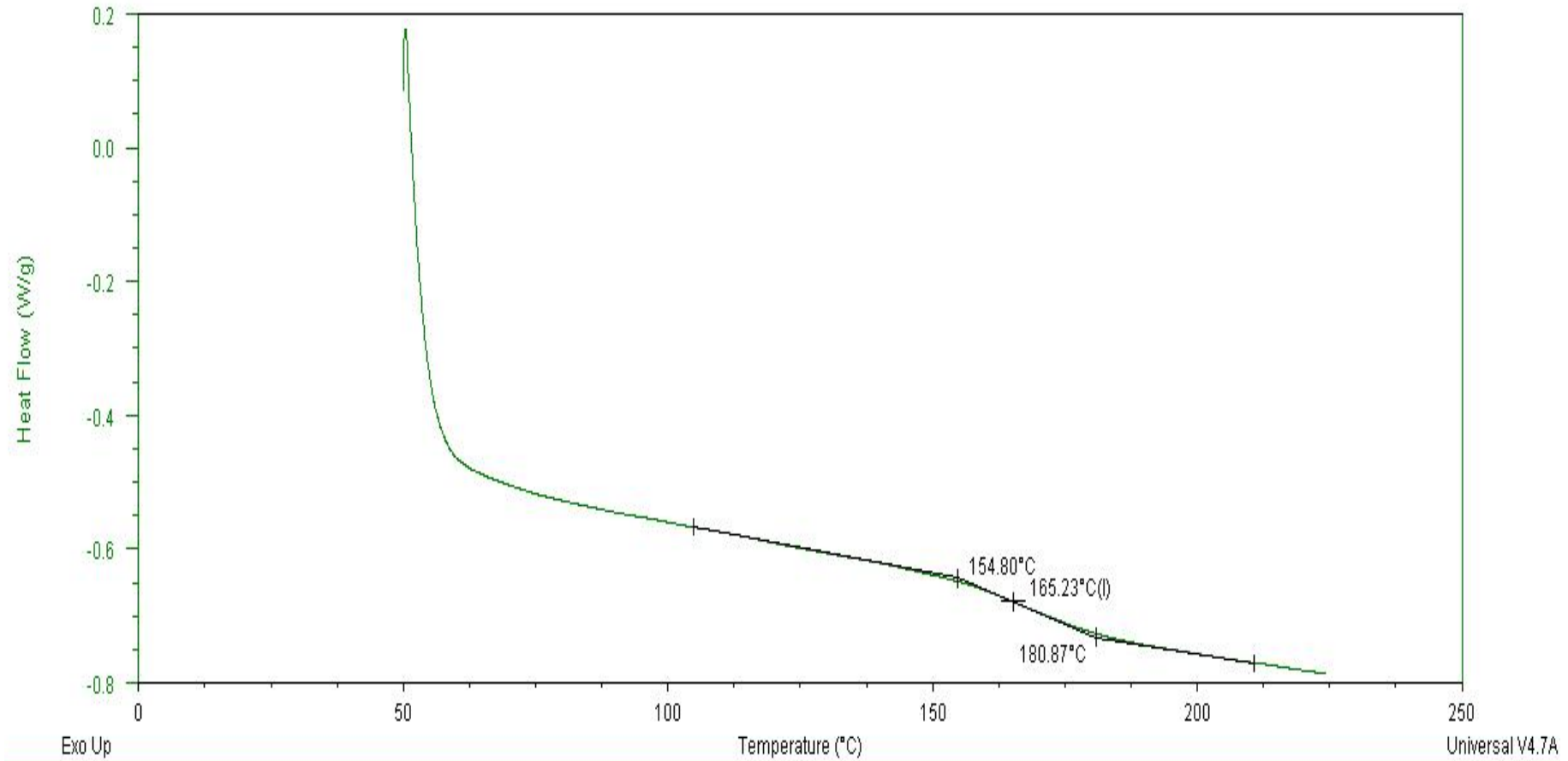
IR CHART (SE-450H)



[Comments]

Thermal Conductivity Epoxy

Tg (SE-450H) – Reference Data



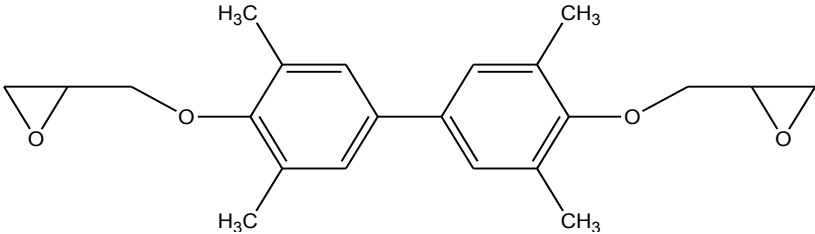
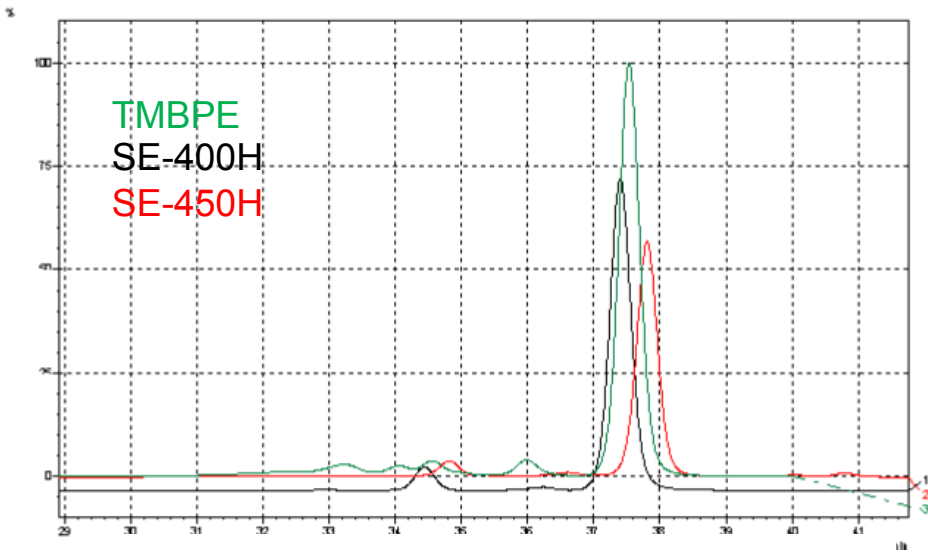
Curing Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 180°C x2hr



Thermal Conductivity Epoxy

GPC Chart (SE-450H)

==== GPC Data Comparison (Ratio) ====



Detector A Ch1

Peak#	Ret. Time	Height	Area	Area %
1	32.656	39	1138	0.079
2	33.287	207	7686	0.532
3	34.786	3592	95106	6.584
4	36.576	1085	38760	2.683
5	37.779	53873	1281530	88.720
6	39.979	41	717	0.050
7	40.766	824	19538	1.353
Total		59662	1444473	100.000

PeakTable

ITEM	n=0	MW	Mn	MWD
TMBPE (JAPAN)	82.6	438	374	1.17006
SE-400H	89.4	368	357	1.03083
SE-450H	88.7	357	349	1.02281



Thermal Conductivity Epoxy

SHIN-A T&C Epoxy Resin

EMC Test Result (Customer H in Korea)

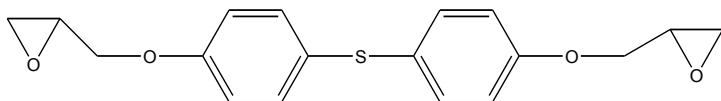
Item	unit	TMBPE (Japan)	SE-400H	SE-450H
Spiral Flow	Inch	43.8	42	47
Hot Hardness	sec.	78	79	76
Gellation Time	-	30	29	31
Viscosity	poise	42.34	45.22	38.18
Adhesive Strength	kgf	7.87	7.40	6.98
Water Absorption(PCT 24h)	%	0.303	0.297	0.301
Tg	℃	119	119	111
Thermal Expansion α_1	ppm	9.1	8.3	8.4
Thermal Expansion α_2	ppm	40	38	40
Flexural Strength (25℃)	kgf/mm ²	17.9	18.0	16.9
Flexural Strength (260℃)	kgf/mm ²	1956	1869	1911



Thermal Conductivity Epoxy

SHIN-A T&C Epoxy Resin

Crystalline Epoxy



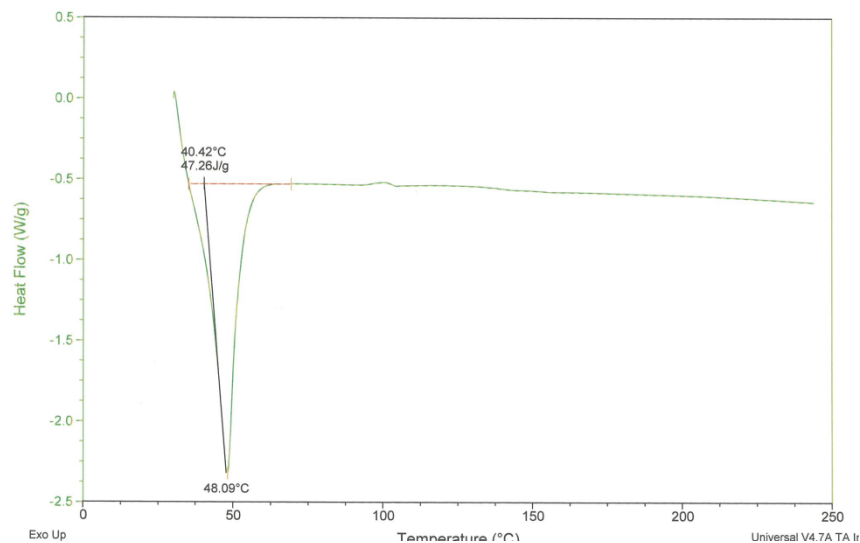
SE-650

- Sulfur Type Epoxy Resin
- Good Adhesion properties.
- Low Melting Point & Low Viscosity
- Good Flexibility, Reduce Stress

Sample: SE-650
Size: 14.1000 mg
Method: 131 scan

DSC

File: C:\...ITAIData\DSC\1 Team\SE-650.001
Operator: Lee JI AE
Run Date: 08-Dec-2010 16:45
Instrument: DSC Q200 V24.4 Build 116



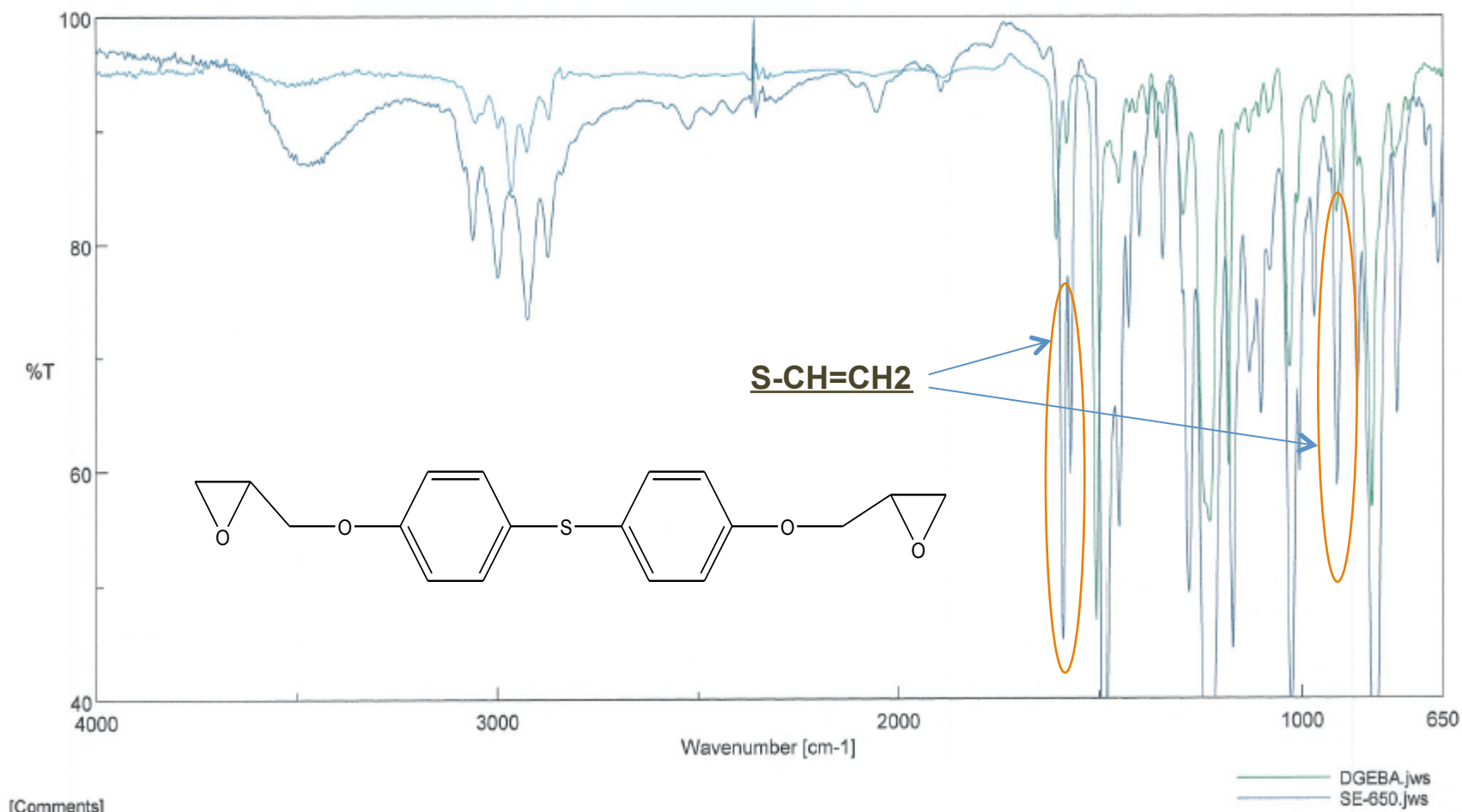
Grade	E.E.W	T-Cl	Geltime(170°C)	Tm(DSC)	S.P(B&R)	ICI 150°C	Features
SE-650	165-185	0.1% Max.	20-40	40-55°C	40-55°C	20cps Max.	Sulfur

Geltime Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 170°C



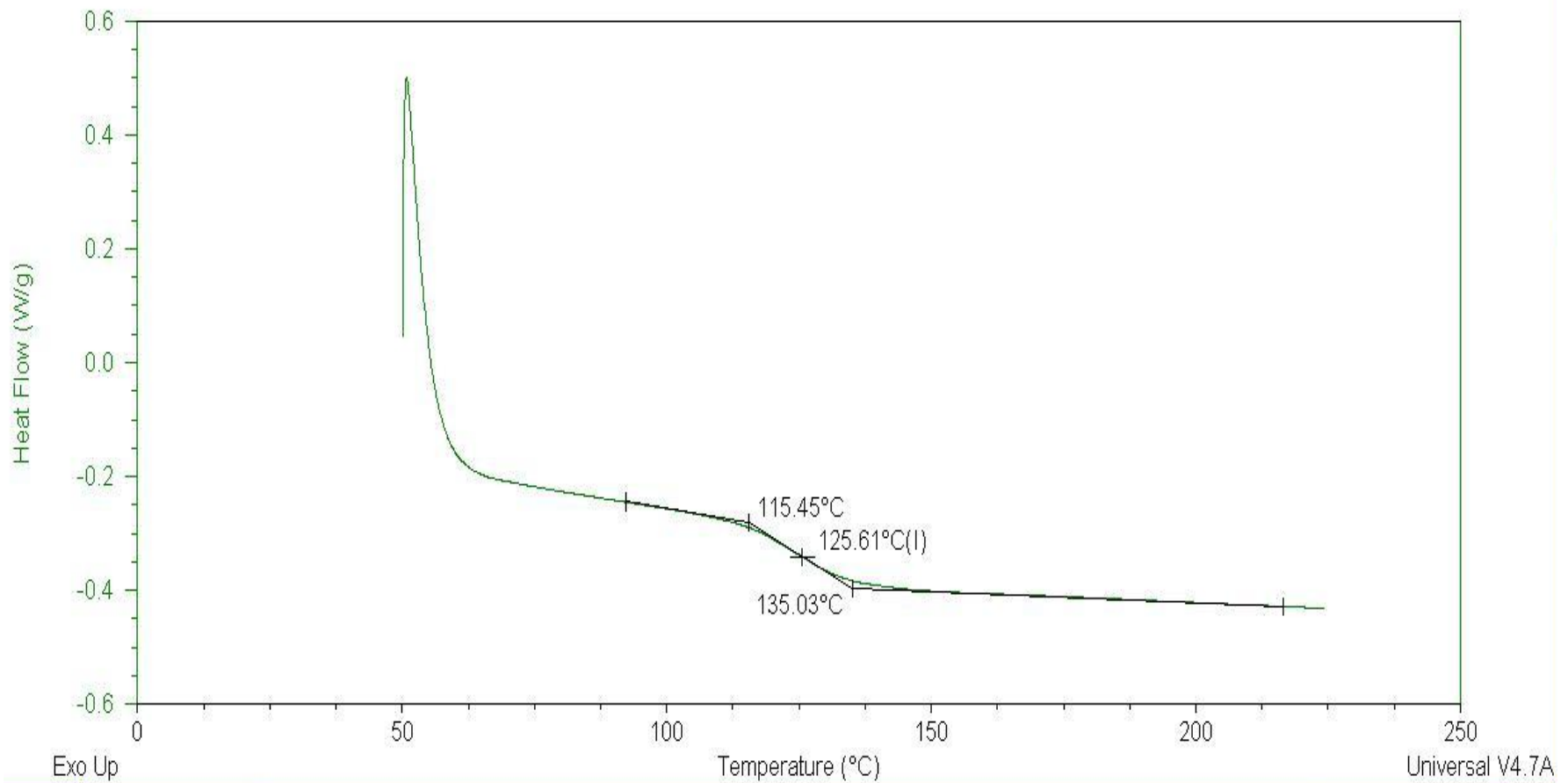
Thermal Conductivity Epoxy

IR CHART (SE-650)



Thermal Conductivity Epoxy

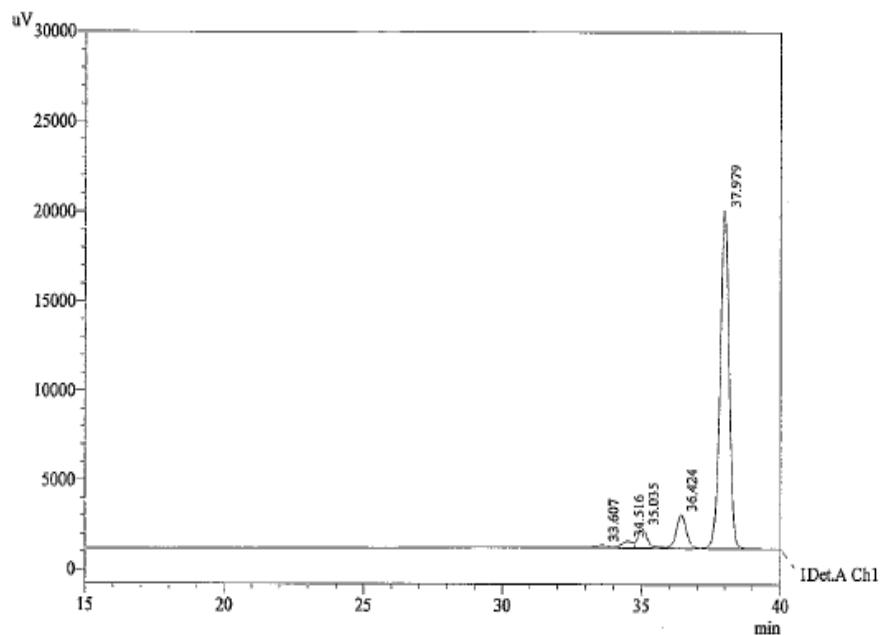
Tg (SE-650) – Reference Data



Curing Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 180°C x2hr

Thermal Conductivity Epoxy

GPC Data (SE-650)

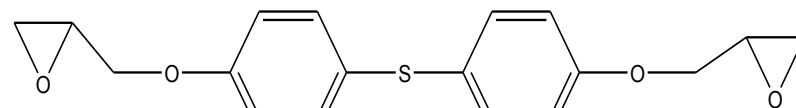


1 Det.A Ch1 /

PeakTable

Detector A Ch1

Peak#	Ret. Time	Height	Area	Area %
1	33.607	148	7140	1.365
2	34.516	398	11143	2.131
3	35.035	1066	26372	5.043
4	36.424	1864	48121	9.201
5	37.979	18884	430212	82.261
Total		22361	522987	100.000

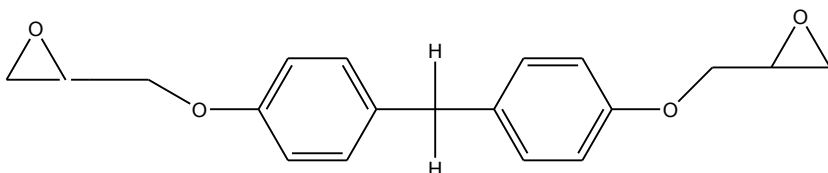


ITEM	n=0	MW	Mn	MWD
SE-650	82.3	361	350	1.03345

Thermal Conductivity Epoxy

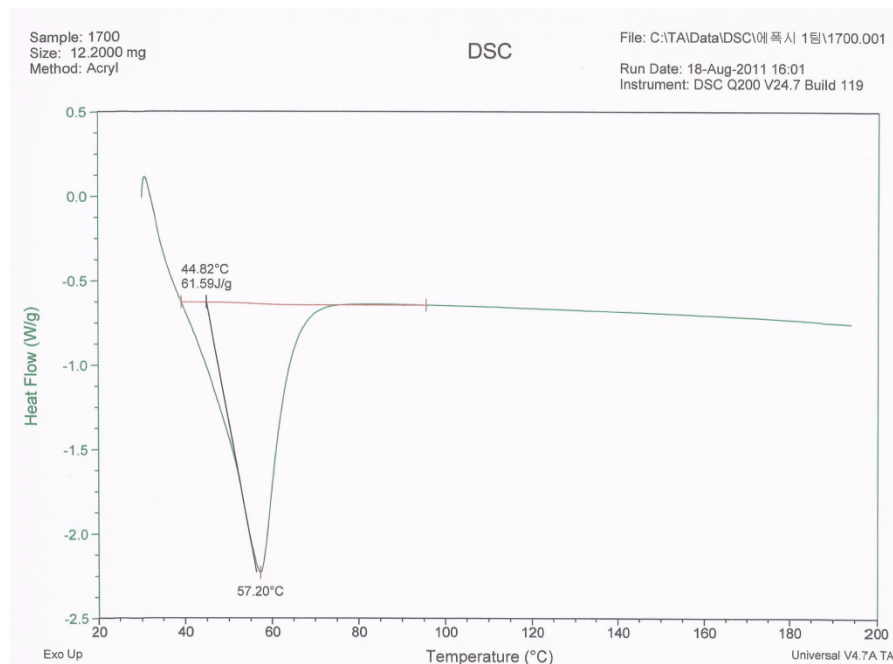
SHIN-A T&C Epoxy Resin

Crystalline Epoxy



SEF-1700

- Bisphenol F Epoxy Resin
- Low Viscosity, Good Spiral flow properties
- High Purity Epoxy resin (isomer content low)



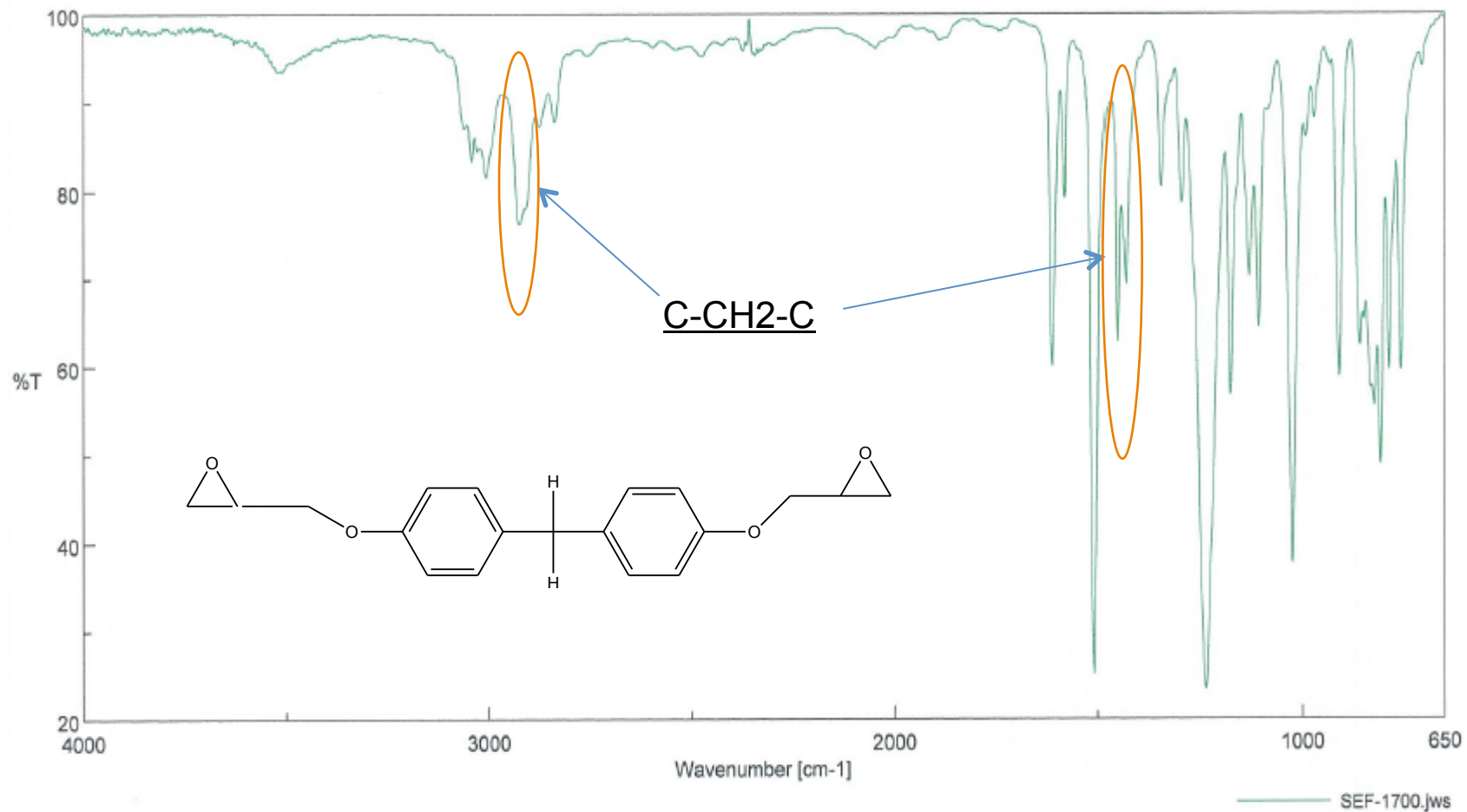
Grade	E.E.W (g/eq)	Hy-Cl	T-Cl	Geltime	ICI 150°C	Tm(DSC)	Tg(DSC)	S.P (B&R)	Features
SEF-1700	155-185	0.05%Max.	0.1% Max.	25-50	20cps Ma x.	50-65°C	90-110°C	50-65°C	BPF

Geltime Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 170°C



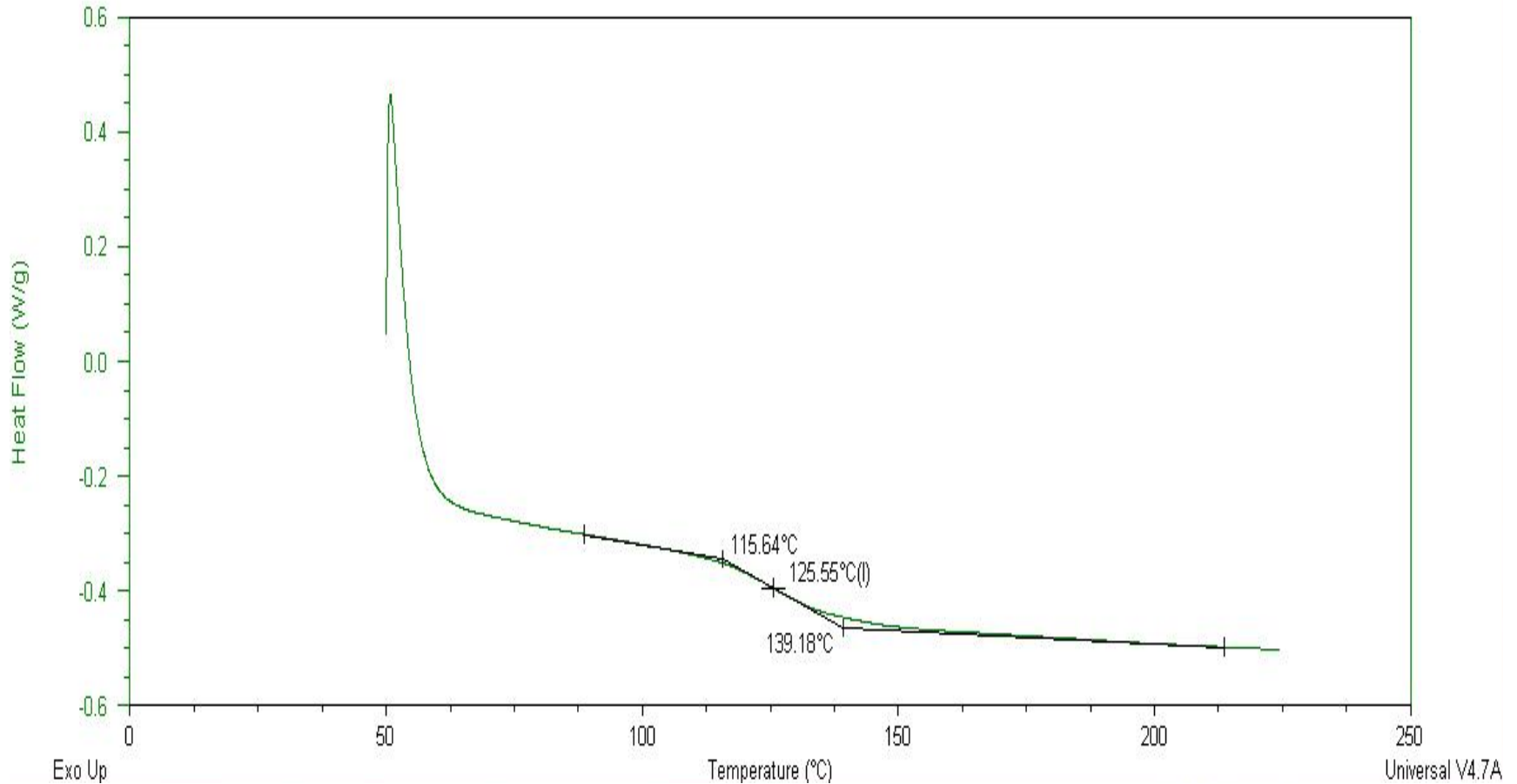
Thermal Conductivity Epoxy

IR CHART (SEF-1700)



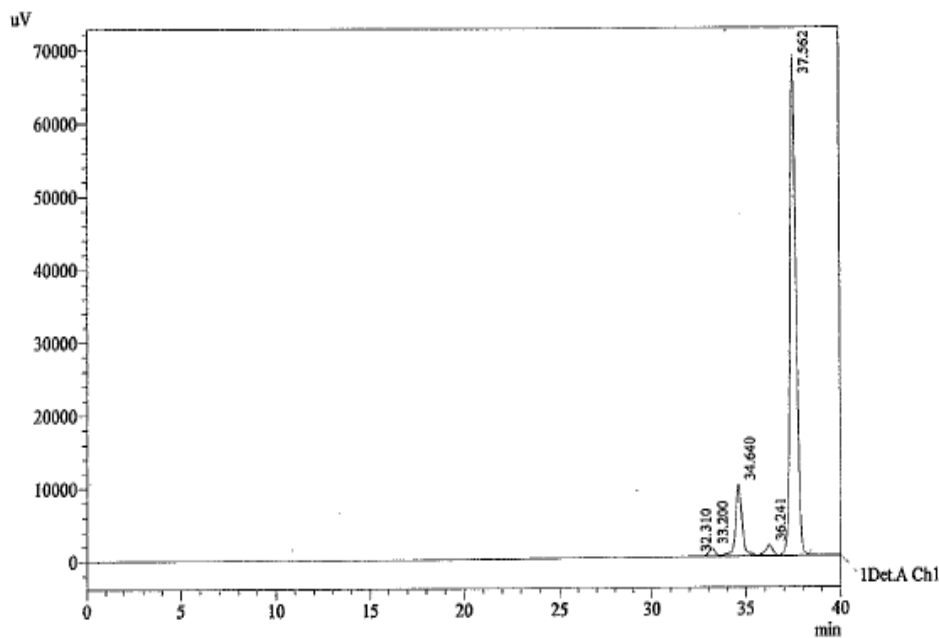
New Epoxy Resin for EMC

T_g (SEF-1700) – Reference Data



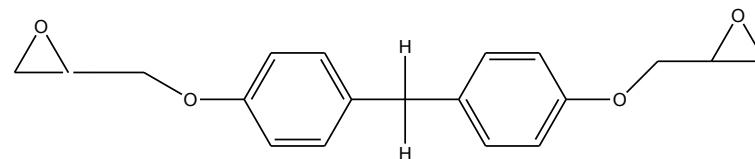
Curing Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 180°C x2hr

GPC Data (SEF-1700)



1 Det.A Ch1 /

Detector A Ch1		PeakTable		
Peak#	Ret. Time	Height	Area	Area %
1	32.310	98	1972	0.109
2	33.200	1094	25650	1.414
3	34.640	9813	231525	12.759
4	36.241	1436	36902	2.034
5	37.562	68541	1518530	83.685
Total		80983	1814579	100.000



ITEM	n=0	MW	Mn	MWD
SEF-1700	83.7	365	351	1.03964

New Epoxy Resin for EMC

Shin-A T&C EMC Series Line up (Specification)

Product	No.	Unit	SE-400H		SE-450H		SEF-1700		SE-650	
			Spec	1111255 S002	Spec	1111267 S001	Spec	1031201 S002	Spec	1051056 J021
EEW	ASTM D1652	g/eq	170 – 19 5	183.2	170 - 19 5	185.0	155 – 18 5	168.5	170 – 17 5	177.5
Hy-Cl	ASTM D1726	ppm	500 Max.	47	500 Max.	313	500 Max.	450	500 Max.	468
T-Cl	ASTM D7359	ppm	1000 Ma x.	614	1000 Ma x.	763	1000 Ma x.	921	1000 Ma x.	872
ICI Visco sity (150°C)	ASTM D4287	cps	20Max.	8.7	20Max.	7.5	20Max.	8.4	20Max.	3.8
Tm	ASTM D3417/ D3418/ E1356	°C	100-115	108.98	100-115	107.69	50-65	57.26	40-55	48.09
S.P	ASTM E28-67	°C	100-115	108.9	100-115	107.9	50-65	54.5	40-55	48.6



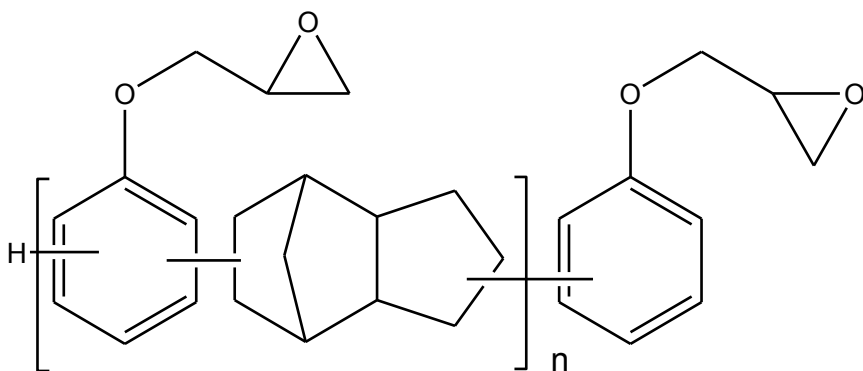
Low Moisture Absorption Epoxy



Low Moisture Absorption Epoxy

SHIN-A T&C Epoxy Resin

Solid Epoxy



XEV-3460

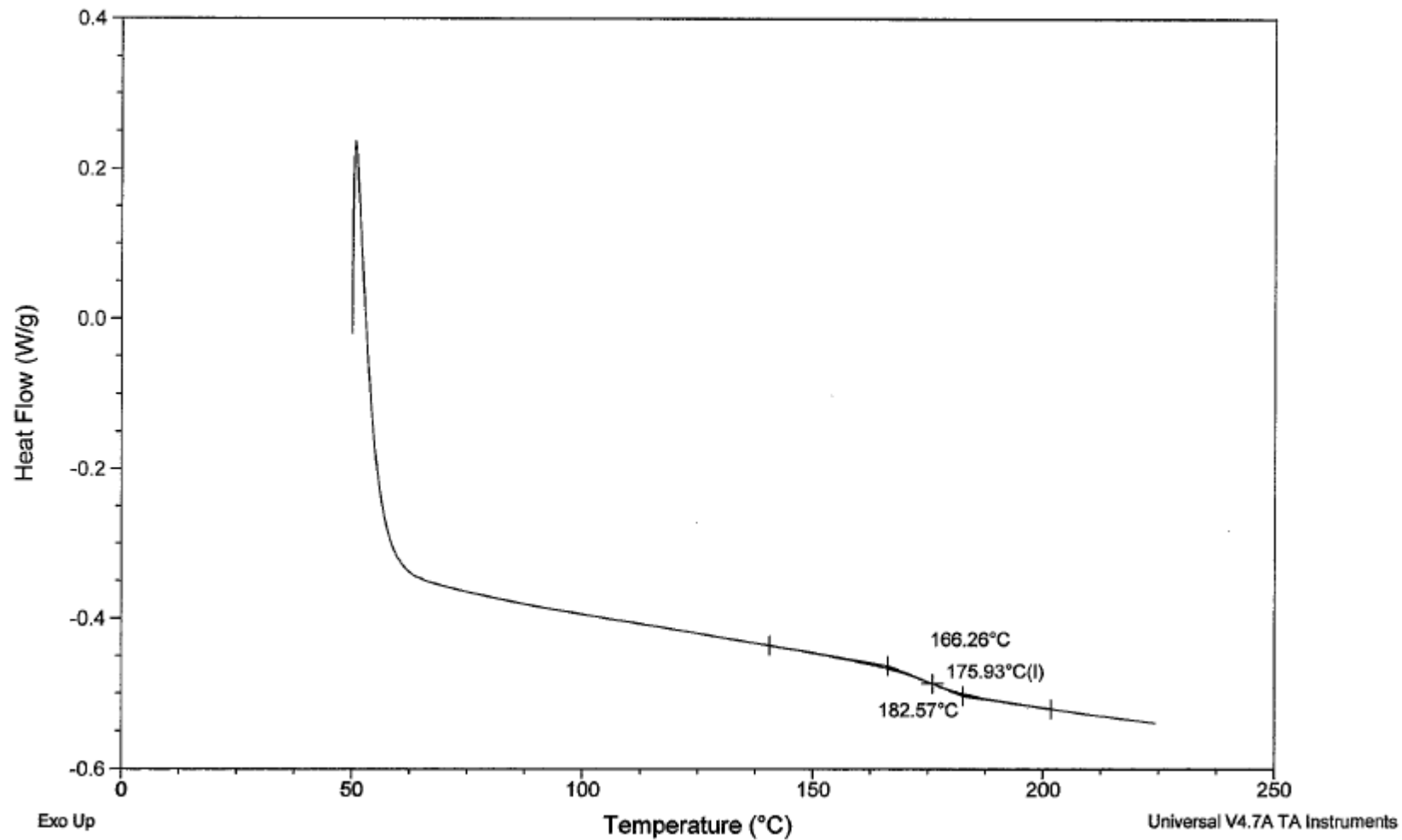
- DCPD Epoxy Resin
- High Tg, Low CTE
- Low Moisture Absorption.

Grade	E.E.W(g/eq)	Hy-Cl	T-Cl	S.P(B&R)	ICI 150°C	Features
XEV-3460	240 - 270	0.1% Max	0.5% Max	51-71°C	500cps Max.	DCPD



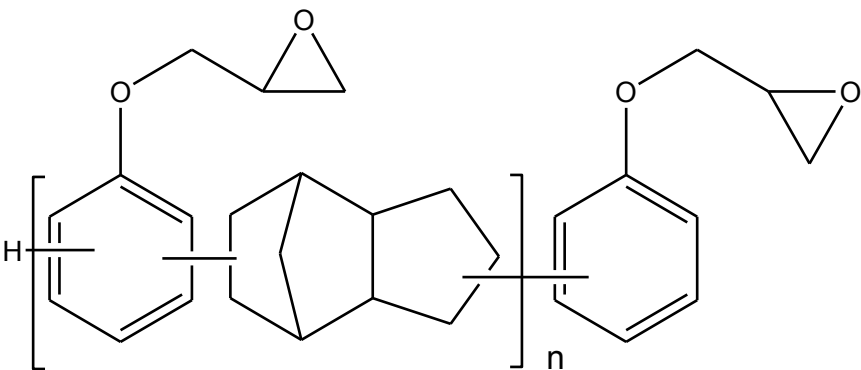
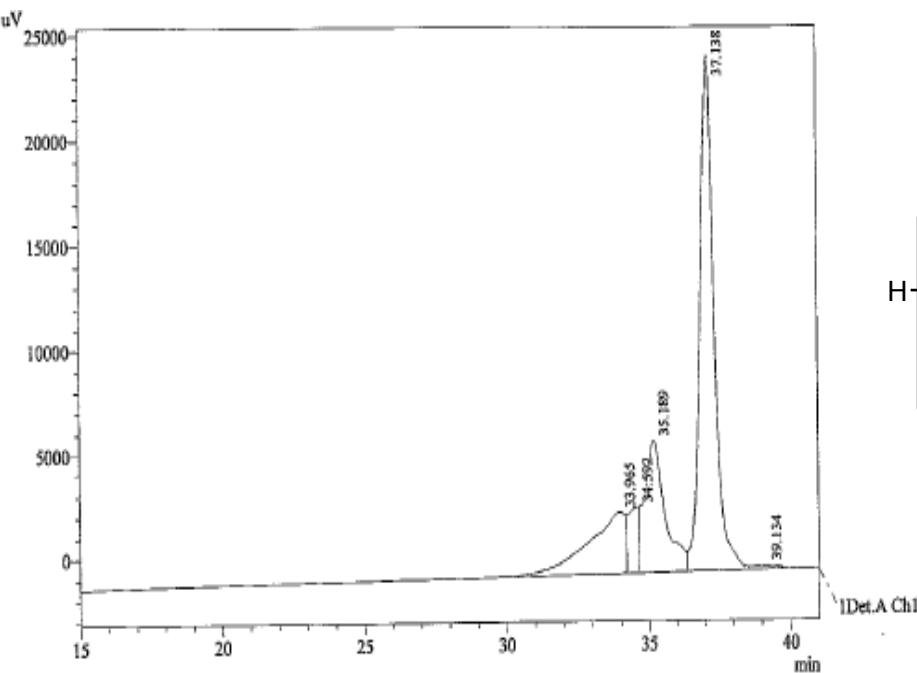
Low Moisture Absorption Epoxy

Tg Data (XEV-3460)



Low Moisture Absorption Epoxy

GPC Data (XEV-3460)



1 Det.A Ch1 /

PeakTable

Detector A Ch1

Peak#	Ret. Time	Height	Area	Area %
1	33.965	2945	269979	17.491
2	34.592	3162	80034	5.185
3	35.189	6353	322655	20.904
4	37.138	24662	859845	55.708
5	39.134	180	10977	0.711
Total		37302	1543490	100.000

ITEM	MW	Mn	MWD
XEV-3460	531	440	1.25407

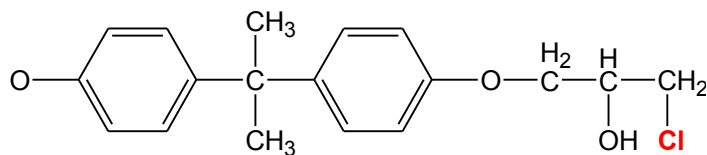


High Purity Epoxy

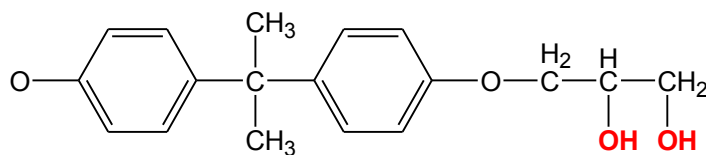


High Purity Epoxy

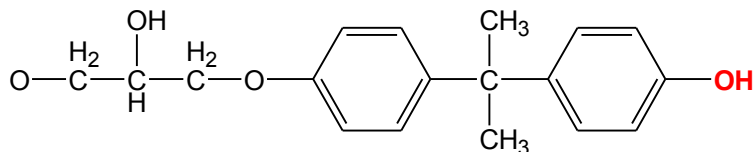
What is the Epoxy Resin of Impurity?



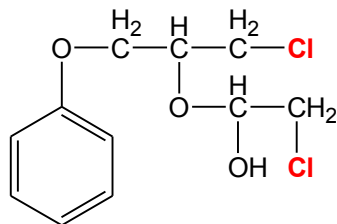
· Hydrolyzable Chloride



· Alpha Glycol, Alpha Diol



· Phenolic OH Group

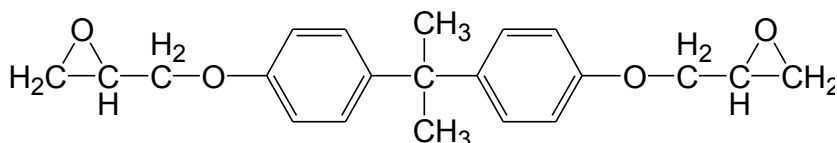


· Total Chloride

High Purity Epoxy

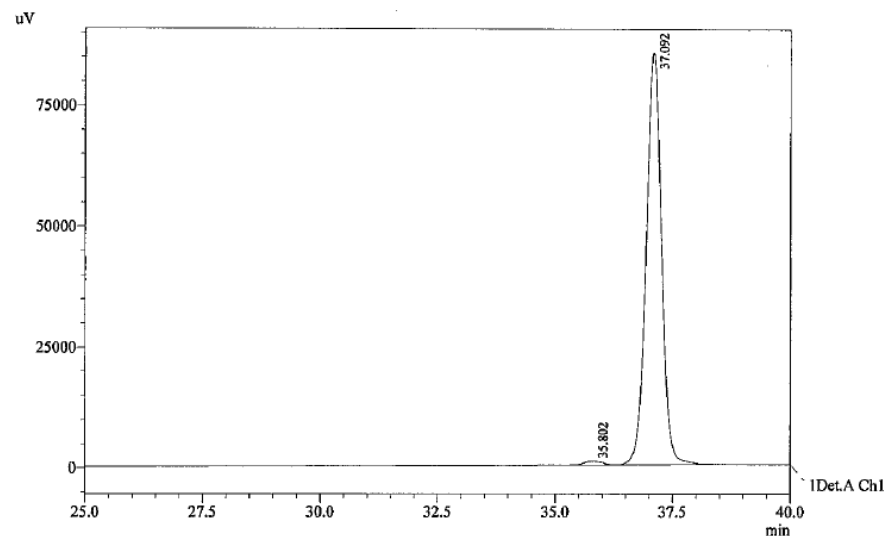
SHIN-A T&C Epoxy Resin

High Purity Epoxy



SE-187M

- High Purity Epoxy Resin
- Good Electrical Properties
- Elctrical Laminates, Castings, Encapsulation
- Crystalline Type
- High BADGE Content
- Low Viscosity, Good Color



1 Det.A Ch1 /

PeakTable

Peak#	Ret. Time	Height	Area	Area %
1	35.802	774	22051	1.122
2	37.092	85396	1943476	98.878
Total		86171	1965527	100.000

Grade	E.E.W(g/eq)	T-Cl(ppm)	Color(G)	Viscosity	Appearance
SE-187 M	170 - 180	500 Max.	0.3 Max.	4,000-10,000	Liquid or Crystal



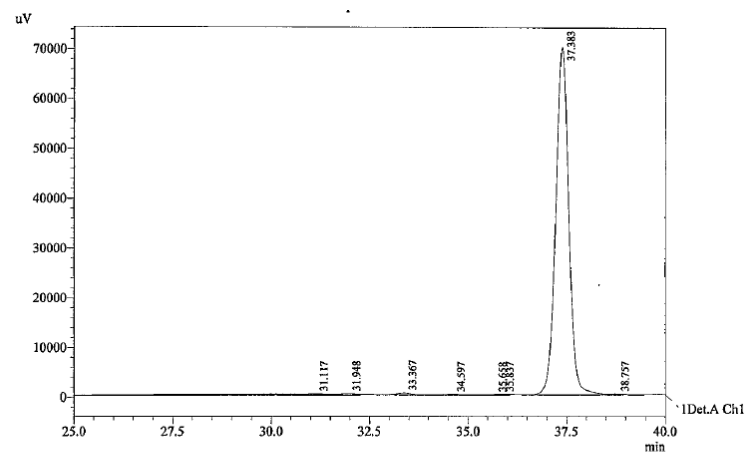
High Purity Epoxy

SHIN-A T&C Epoxy Resin

High Purity Epoxy

SE-187PM

- High Purity Epoxy Resin
- Good Electrical Properties
- Elctrical Laminates, Castings, Encapsulation
- Crystalline Type



Detector A Ch1

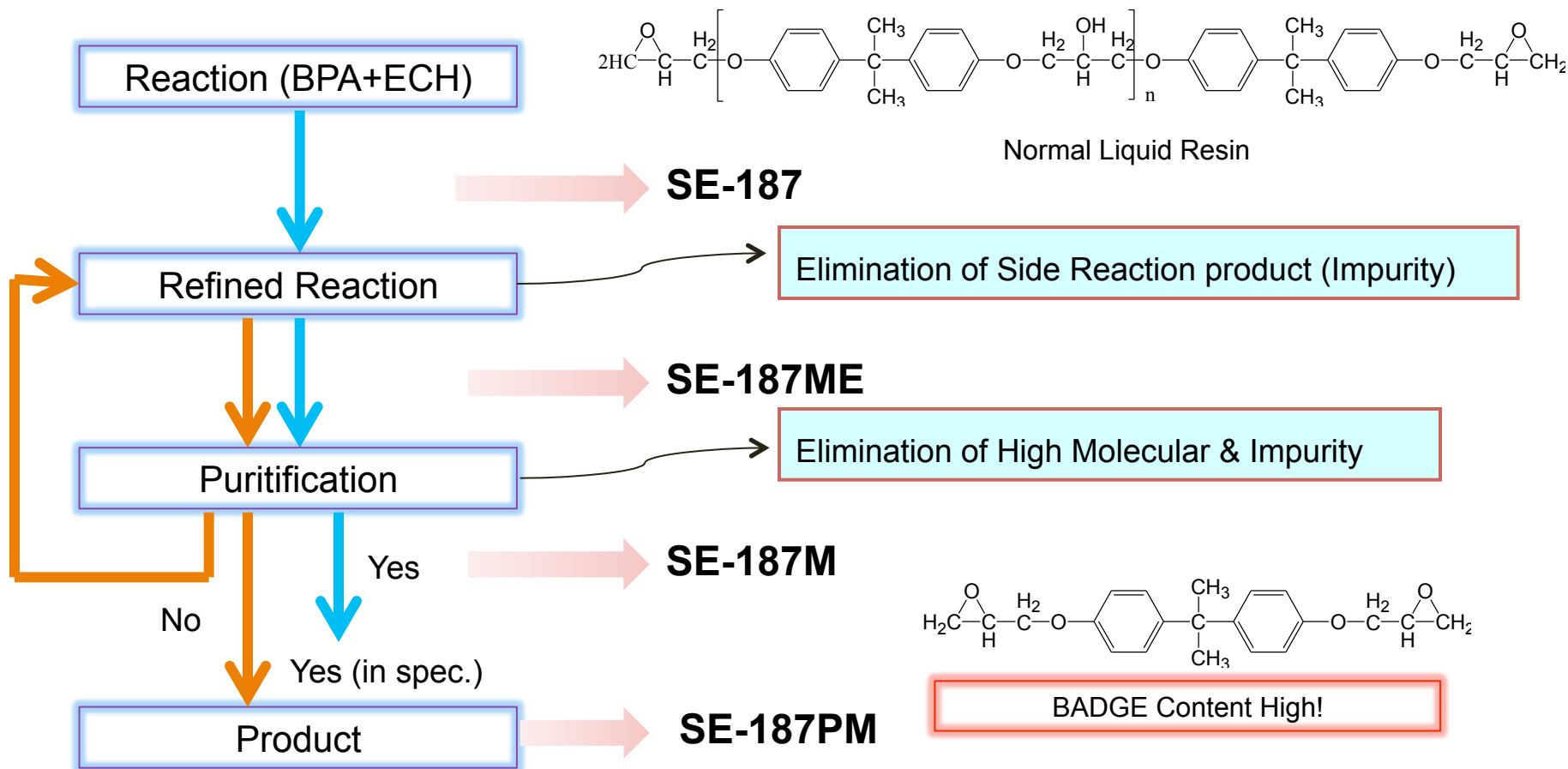
Peak#	Ret. Time	Height	Area	Area %
1	31.117	220	50340	2.964
2	31.948	260	9903	0.583
3	33.367	403	10118	0.596
4	34.597	121	3545	0.209
5	35.638	75	2556	0.150
6	35.837	123	3789	0.223
7	37.383	70041	1613833	95.028
8	38.757	174	4194	0.247
Total		71417	1698278	100.000

Grade	E.E.W(g/eq)	T-Cl(ppm)	Color(G)	Viscosity	Appearance
SE-187P M	170 - 175	200 Max.	0.3 Max.	3,000-6,000	Liquid or Crystal



High Purity Epoxy

Process of High Purity Epoxy Resin



High Purity Epoxy

Shin-A T&C SE-187 Series Line up (Specification)

Product	No.	Unit	SE-187		SE-187ME		SE-187M		SE-187PM	
			Spec	1091047S 001	Spec	1121287S 001	Spec	1101166S 001	Spec	1101288S 001
EEW	JIS-K7236	g/eq	180 – 200	185.9	180 - 190	186.2	170 – 180	171.9	170 – 175	171.6
Hy-Cl	ASTM D172 6	ppm	200 max.	78	200 Max.	188	100 Max.	57	100 Max.	13
T-Cl	ASTM D735 9	ppm	900 Max.	880	600 Max.	582	500 Max.	482	200 Max.	103
Viscosity	JIS-K7233	cps	9,000 – 10,000	9,600	12,000 – 1 5,000	13,349	4,000 – 10,000	4,500	3,000 – 6, 000	3,950
Appearance	-	-	Liquid	Liquid	Liquid	Liquid	Crystalline	Crystalline	Crystalline	Crystalline
Color	JIS-K6901	G	0.4 Max.	0.2	0.5 max.	0.1	0.3 Max.	0.1	0.3 Max.	0.1
n=0 Content	ASTM D341 7/D3418/E1 356	%	80.0 – 90. 0	84..3	80.0 – 90. 0	82.7	98.0 Min.	98.3	98.0Min	99.6



Low CTE Epoxy



Low CTE Epoxy

SHIN-A T&C Epoxy Resin

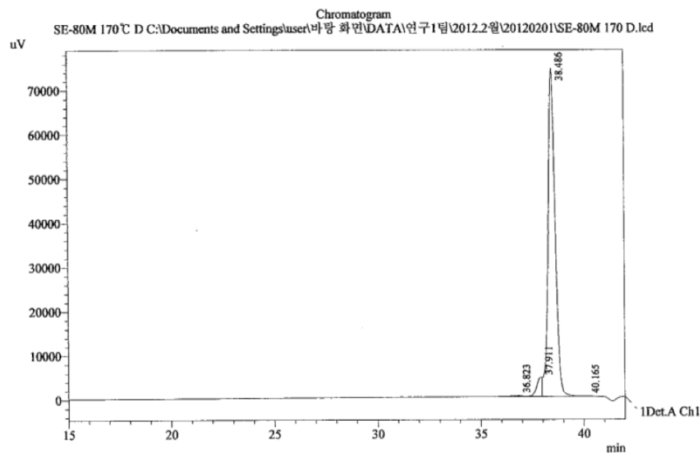
High Purity Epoxy

SE-80P

- High Purity Epoxy Resin
- Good Electrical Properties
- Electrical Laminates, Castings, Encapsulation
- Crystalline Type



Sample Information
 Sample Name : SE-80M 170℃ D
 Sample ID :
 Data Filename : C:\Documents and Settings\user\바탕 화면\DATA\연구1팀\2012.2월\20120201\SE-80M 170 D.lcd
 Method Filename : C:\Documents and Settings\user\바탕 화면\Method\Method.lcm
 Date Acquired : 2012-02-01 오전 11:35:28



1 Det.A Ch1 /

PeakTable

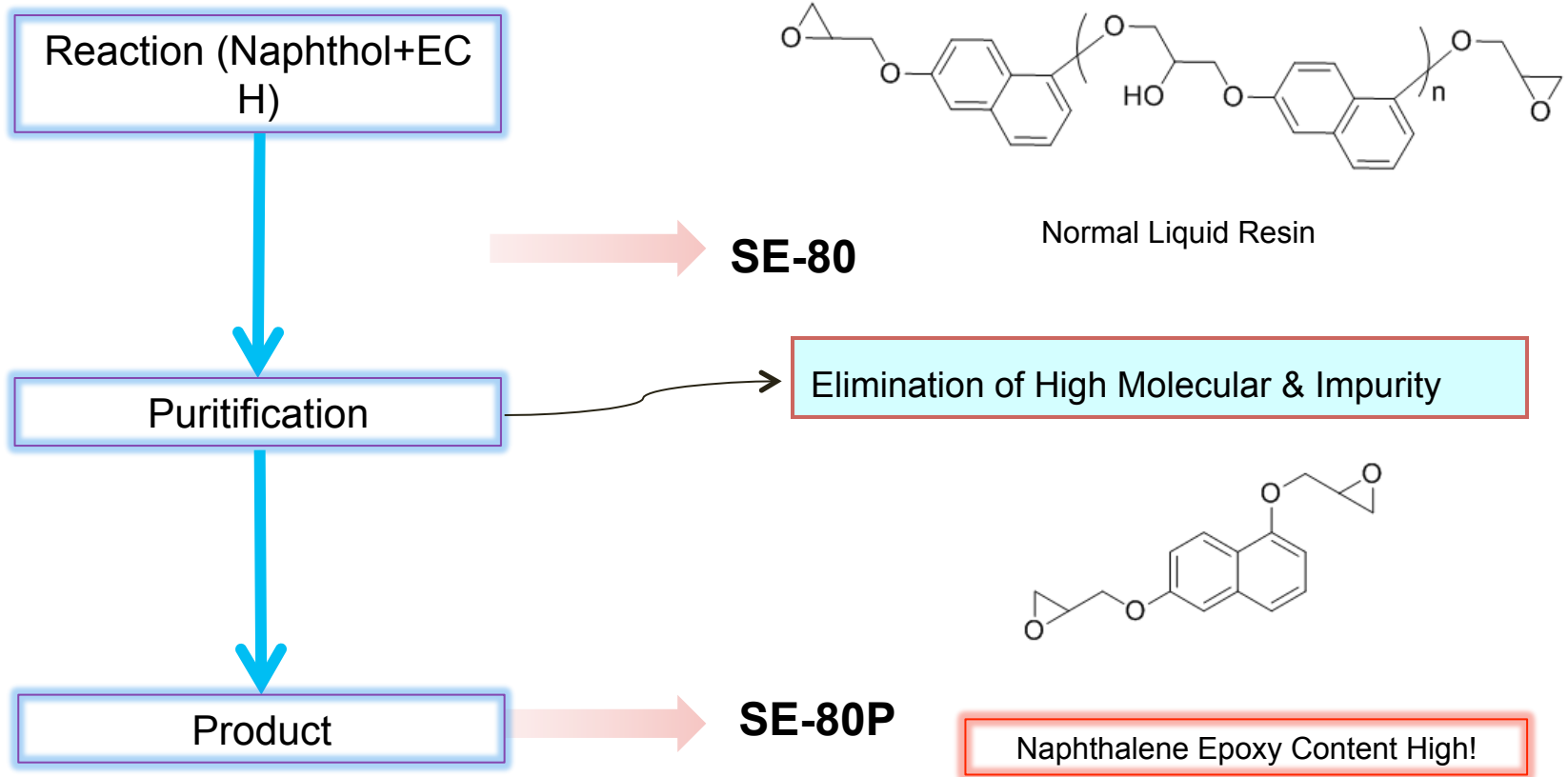
Peak#	Ret. Time	Height	Area	Area %
1	36.823	237	8618	0.462
2	37.911	4327	78130	4.192
3	38.486	74237	1773829	95.185
4	40.165	125	2992	0.161
Total		78925	1863570	100.000

Grade	E.E.W(g/eq)	T-Cl(ppm)	Color(G)	Viscosity	Appearance
SE-80P	135-150	900 Max.	-	15,000 – 30,000	Liquid or Crystal



Low CTE Epoxy

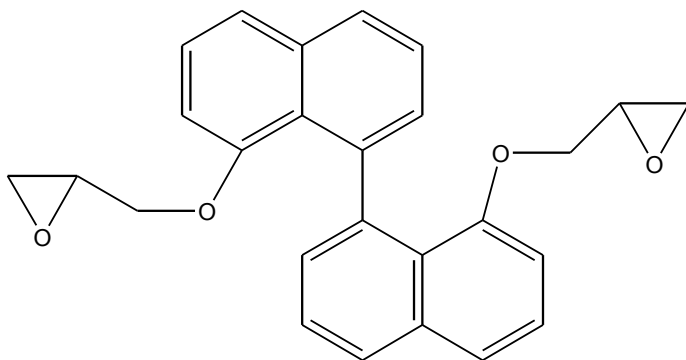
Process of High Purity Epoxy Resin



New Epoxy Resin for EMC

SHIN-A T&C Epoxy Resin

Solid Epoxy



SE-165

- Mesogen Epoxy Resin
- High T_g, Excellent Adhesion,
- Excellent Flame retardant
- Low moisture Absorption

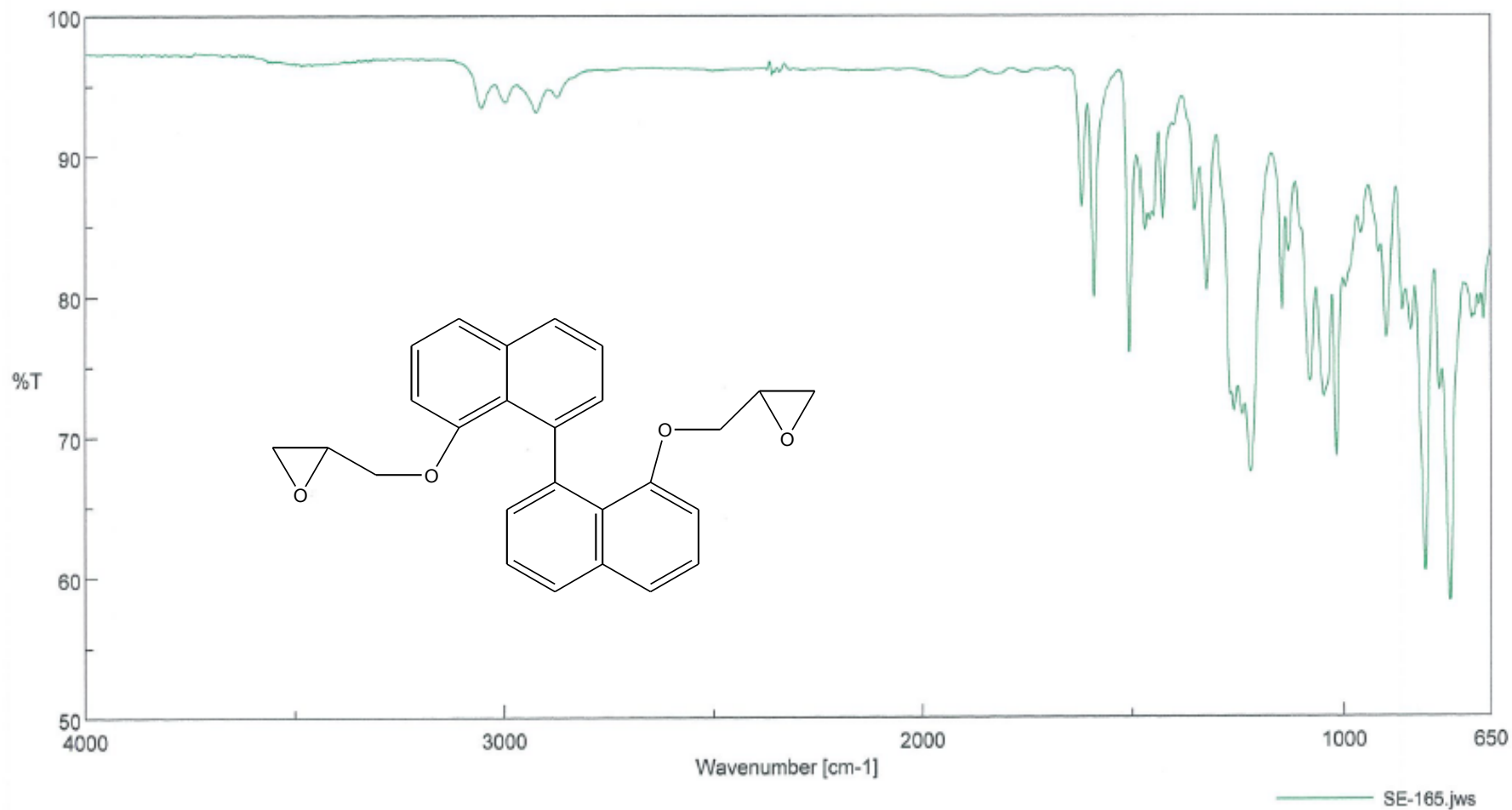
Grade	E.E.W (g/eq)	Hy-Cl	T-Cl	Geltime(170 °C)	S.P (B&R)	ICI 150°C	Features
SE-165	220-250	0.05% Max.	0.1% Max.	55-75	55-75°C	100cps Max.	Naphthalene

Geltime Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 170°C



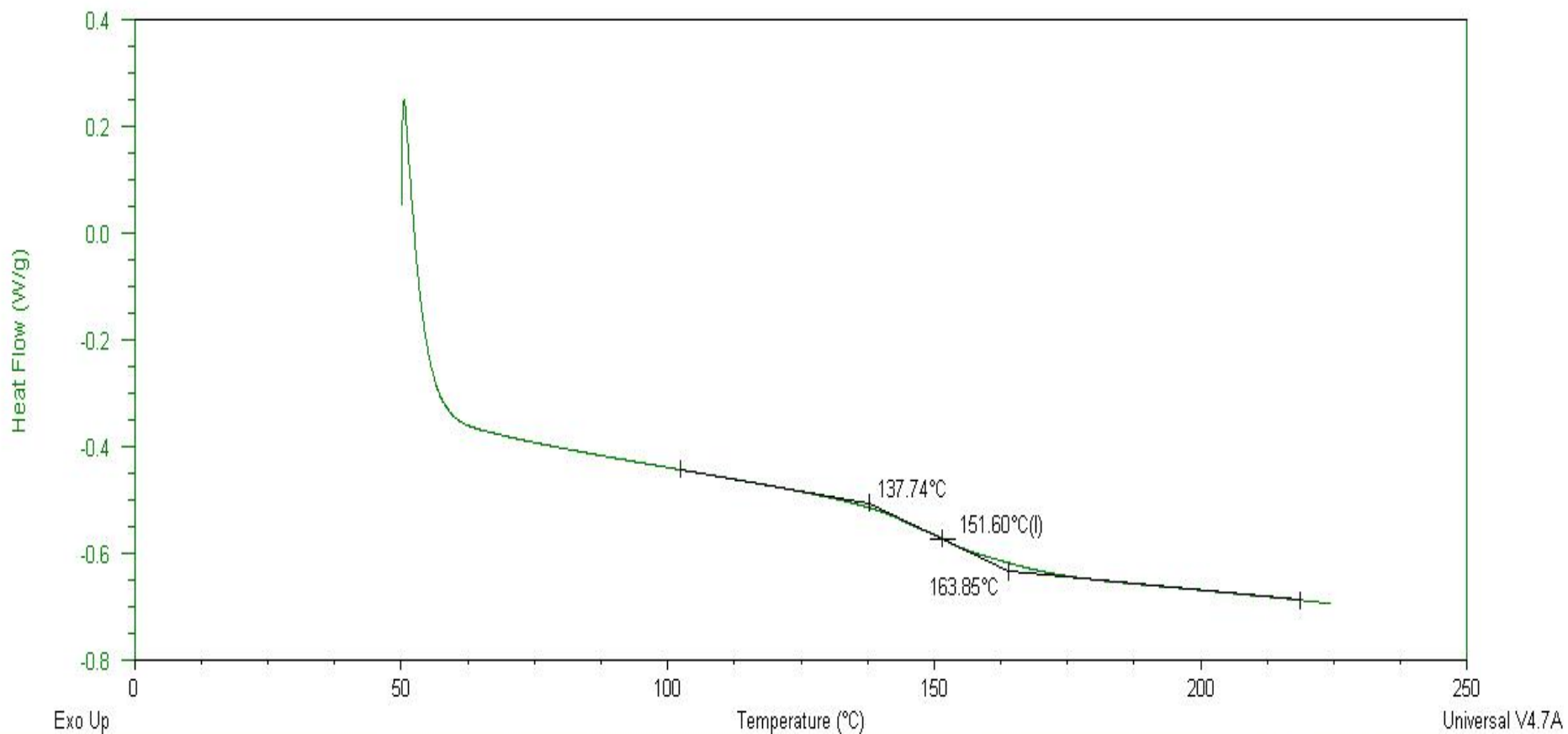
New Epoxy Resin for EMC

IR CHART (SE-165)



New Epoxy Resin for EMC

Tg (SE-165) – Reference Data

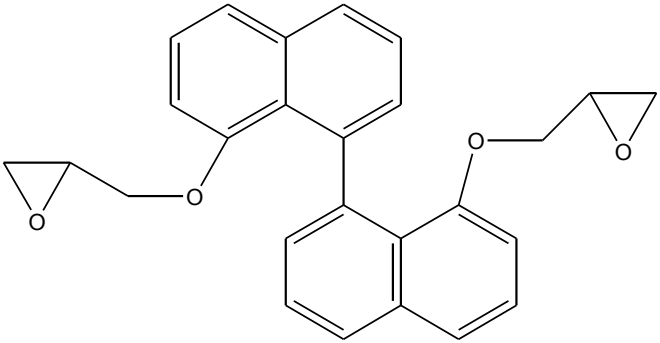
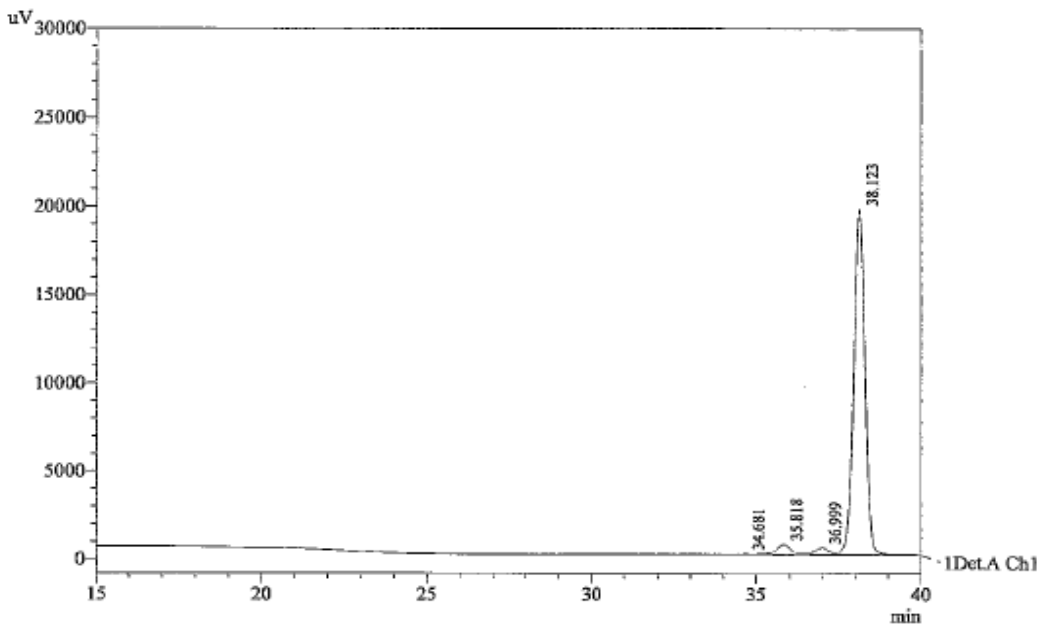


Curing Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 180°C x2hr



New Epoxy Resin for EMC

GPC Data (SE-165)



1 Det.A Ch1 /

PeakTable				
Peak#	Ret. Time	Height	Area	Area %
1	34.681	24	690	0.140
2	35.818	573	16232	3.287
3	36.999	378	11157	2.260
4	38.123	19557	465682	94.313
Total		20532	493761	100.000

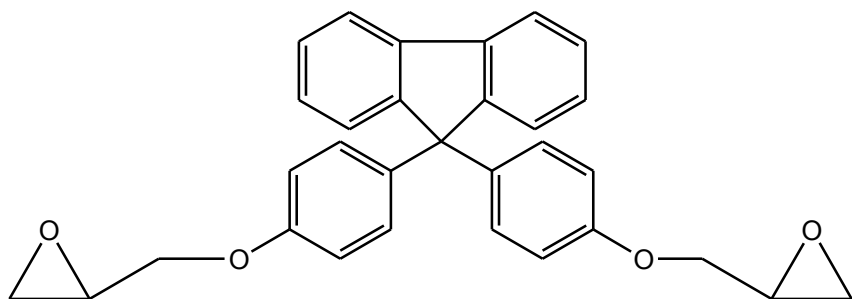
ITEM	n=0	MW	Mn	MWD
SE-165		336	335	1.00417



New Epoxy Resin for EMC

SHIN-A T&C Epoxy Resin

Solid Epoxy



SE-250

- Fluorene Epoxy Resin
- High T_g, Good Adhesion
- Low Viscosity

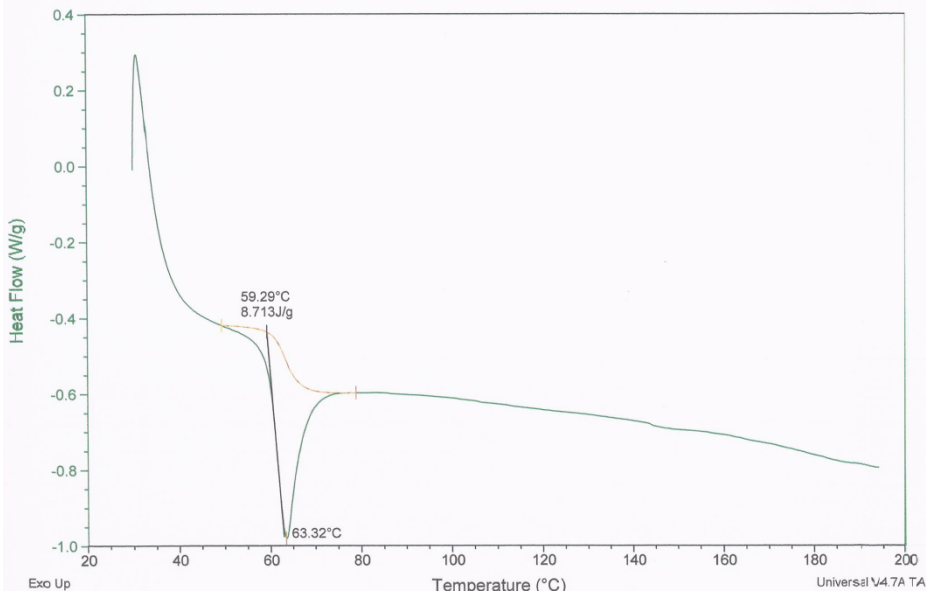
Sample: 250
Size: 7.0000 mg
Method: Acryl

DSC

File: C:\TA\Data\DSC\에폭시 1팀\250.001

Run Date: 18-Aug-2011 16:18

Instrument: DSC Q200 V24.7 Build 119



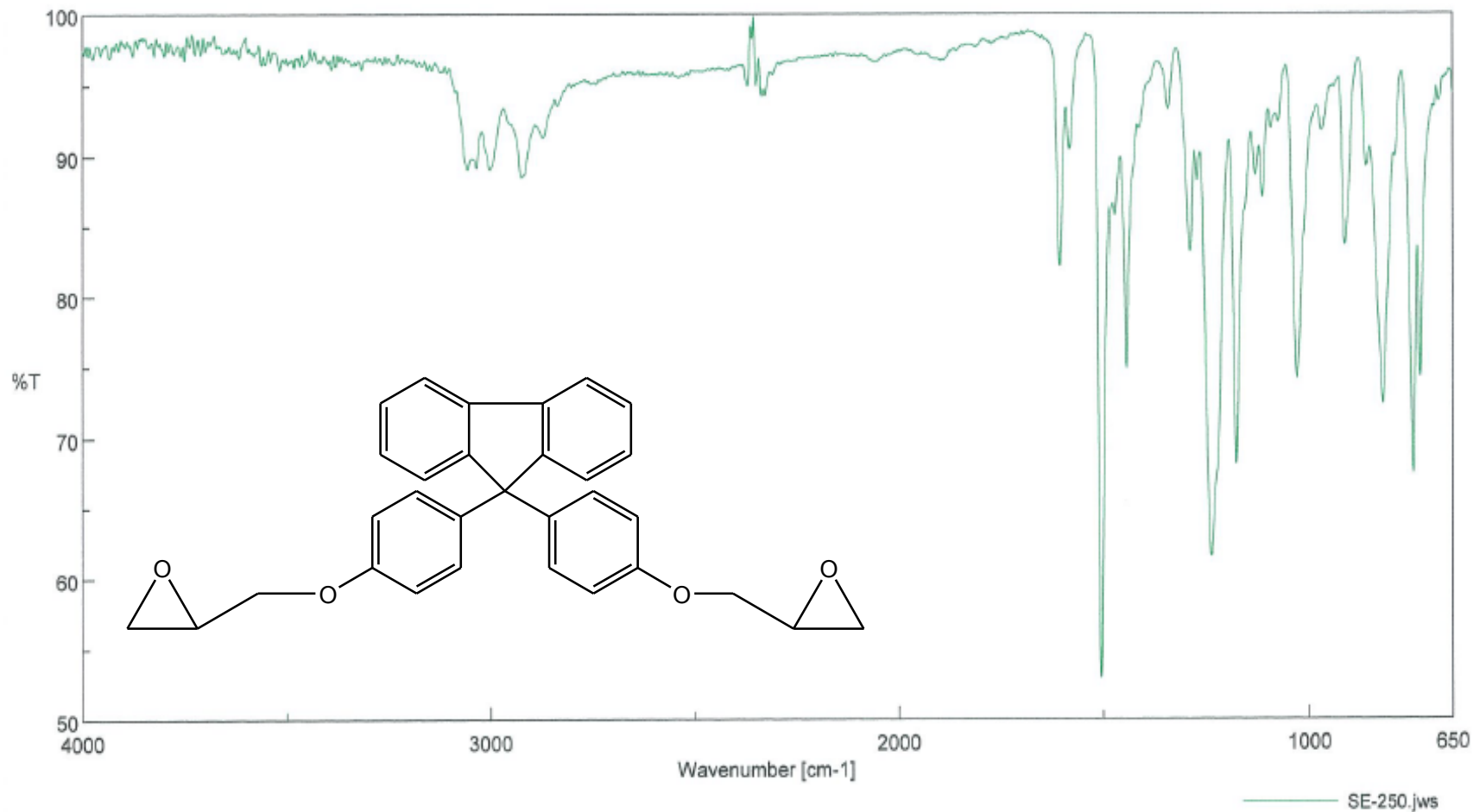
Grade	E.E.W(g/eq)	Hy-Cl	T-Cl	Geltime (170°C)	S.P(B&R)	ICI 150°C	Tm (DSC)	Features
SEB-250	230 - 270	0.05% Max.	0.1% Max.	40-65	75-90°C	200cps Max.	55-70°C	Fluorene

Geltime Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 170°C



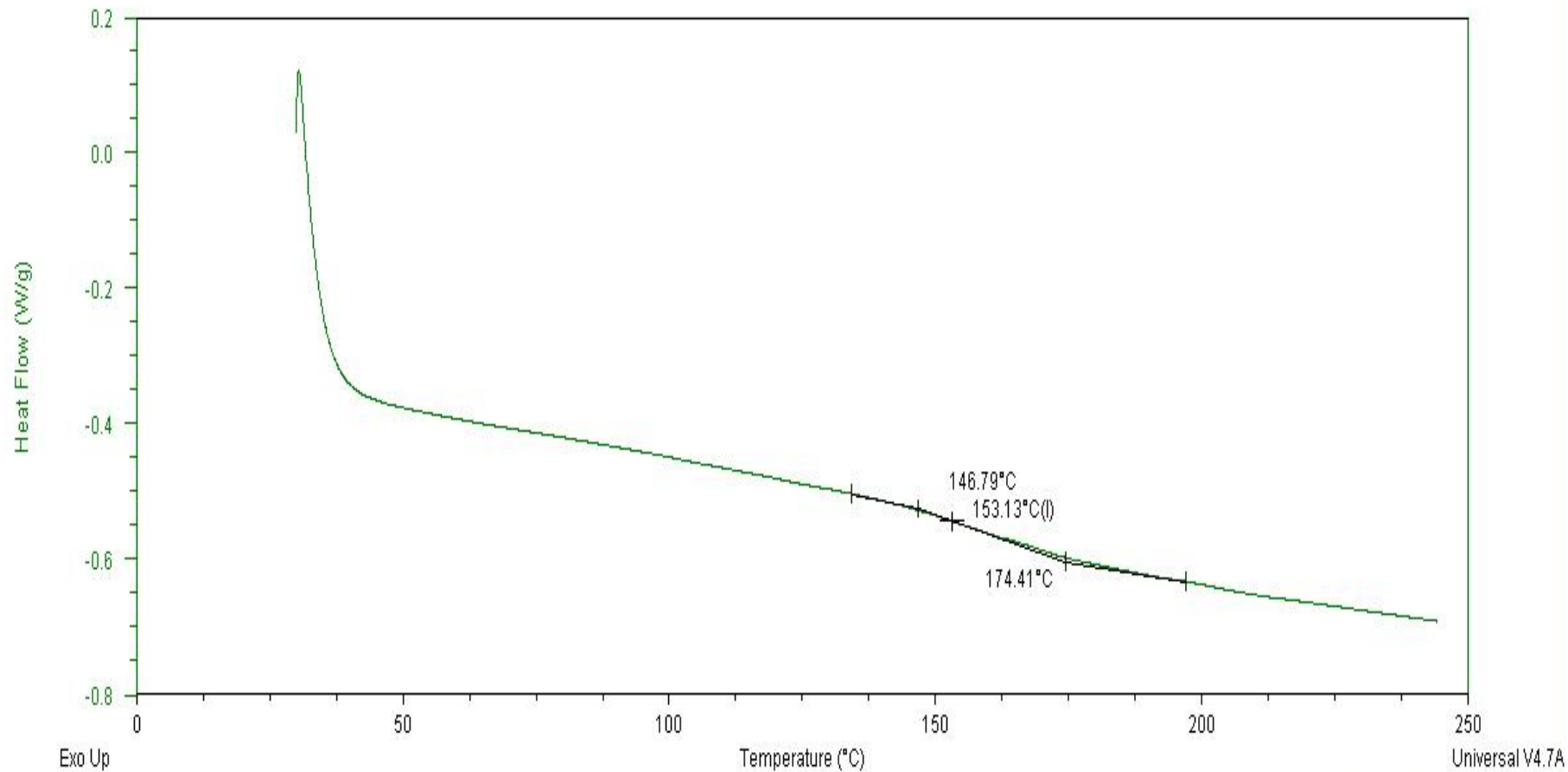
New Epoxy Resin for EMC

IR CHART (SE-250)



New Epoxy Resin for EMC

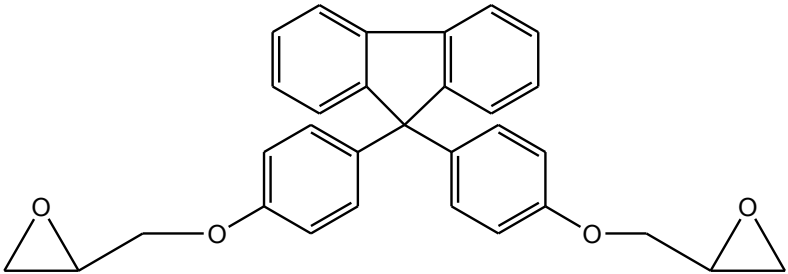
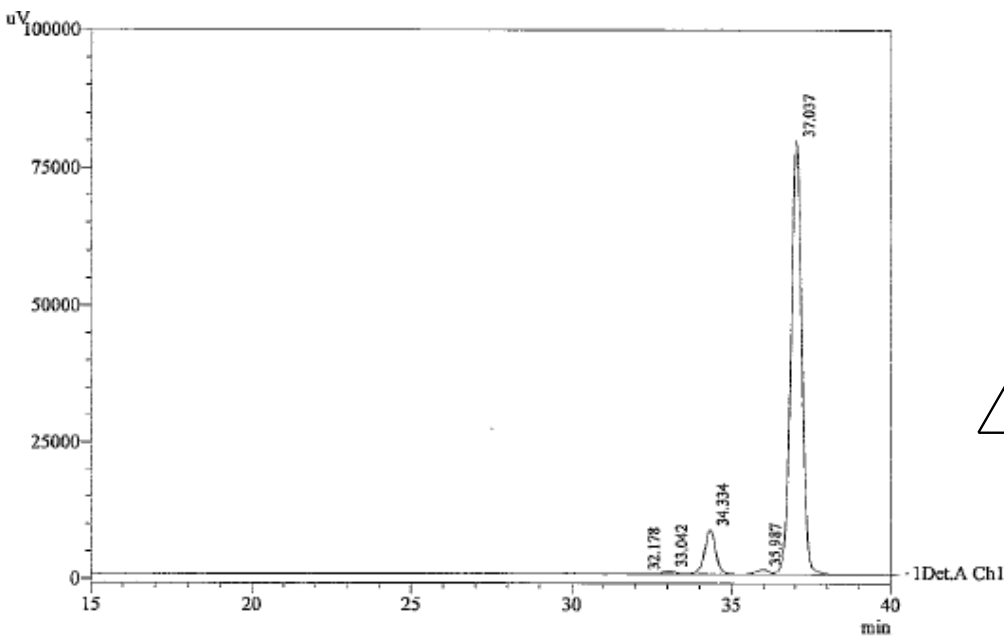
T_g (SE-250)



Curing Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 180°C x2hr

New Epoxy Resin for EMC

GPC Data (SE-250)



1 Det.A Ch1 /

PeakTable				
Detector A Ch1				
Peak#	Ret. Time	Height	Area	Area %
1	32.178	32	656	0.031
2	33.042	626	16890	0.793
3	34.334	8190	204718	9.607
4	35.987	873	23926	1.123
5	37.037	79134	1884648	88.446
Total		88854	2130838	100.000

ITEM	n=0	MW	Mn	MWD
SE-250	88.4	395	378	1.04468



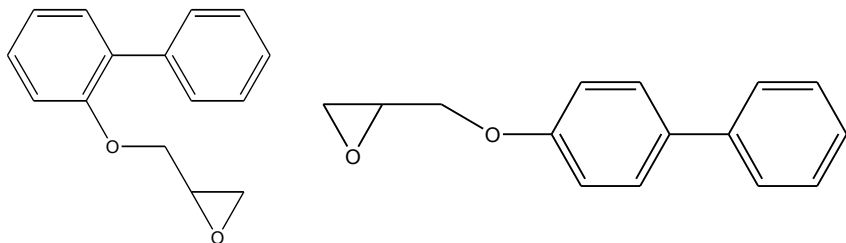
Low Viscosity Epoxy



Low Viscosity Epoxy Resin

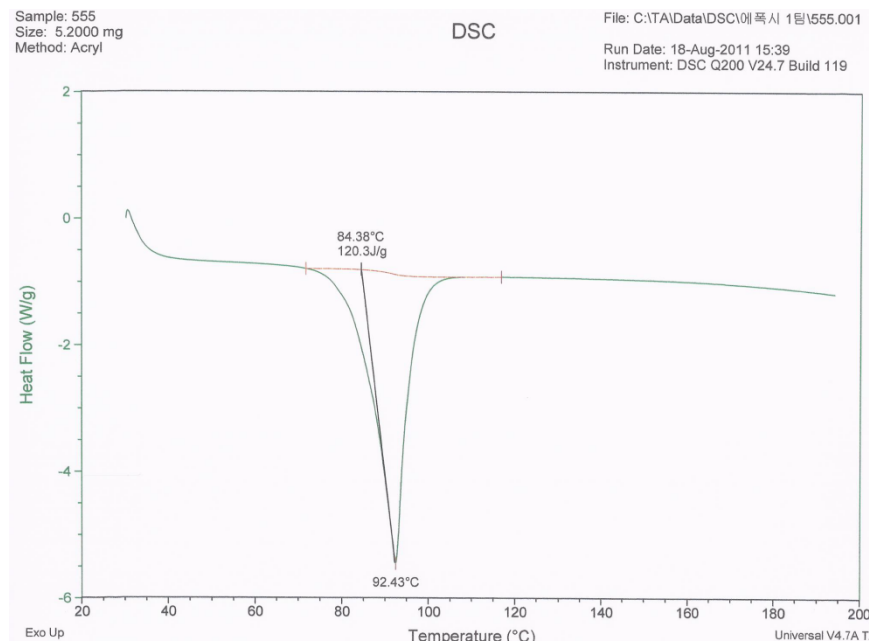
SHIN-A T&C Epoxy Resin

Crystalline Epoxy



SE-500, 555

- o-phenylphenol, p-phenylphenol Epoxy Resin
- Low Viscosity, Good Spiral flow properties
- Hybrid System with OCNE and Novolac.

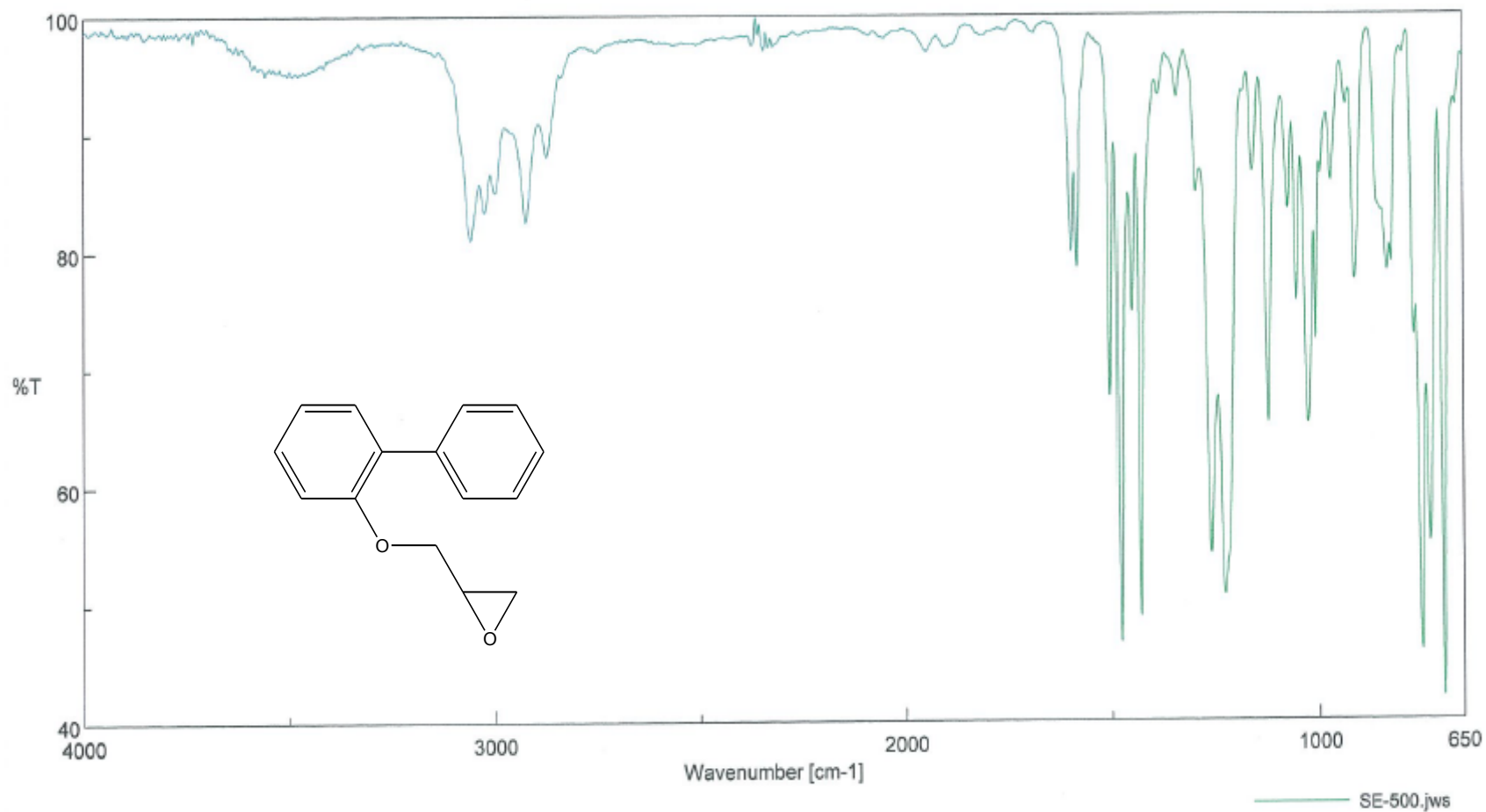


Grade	E.E.W(g/eq)	Hy-Cl	T-Cl	Tm(DSC)	S.P(B&R)	ICI 150°C	Features
SE-500	200 - 300	0.05% Max	0.1% Max	N.A	N.A	20cps Max.	opp
SE-555	200 - 300	0.05% Max	0.1% Max	85-100°C	85-100°C	20cps Max.	ppp



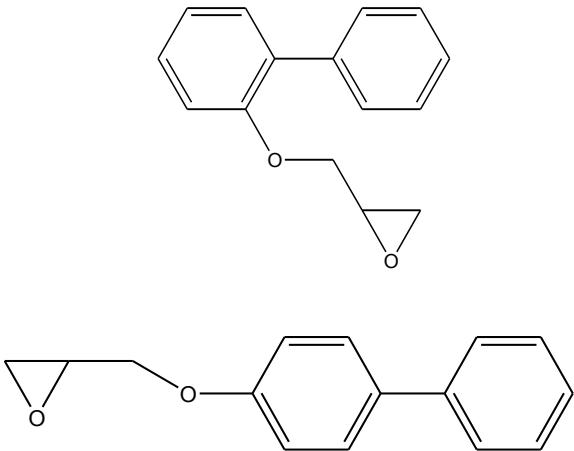
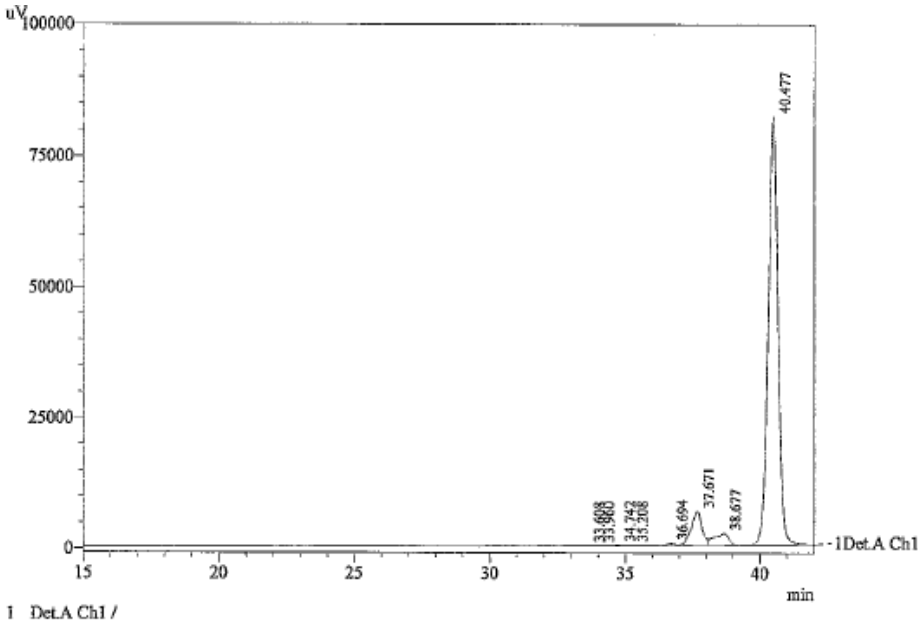
Low Viscosity Epoxy Resin

IR CHART (SE-500)



Low Viscosity Epoxy Resin

GPC Data (SE-500, 555)



Detector A Ch1

PeakTable

Peak#	Ret. Time	Height	Area	Area %
1	33.608	12	1118	0.048
2	33.960	52	1315	0.056
3	34.742	152	3851	0.165
4	35.208	61	1120	0.048
5	36.694	382	11427	0.491
6	37.671	6494	181976	7.812
7	38.677	2225	85498	3.670
8	40.477	81768	2043208	87.710
Total		91144	2329513	100.000

ITEM	n=0	MW	Mn	MWD
SE-550	87.7	384	382	1.00454
SE-555	91.2	349	348	1.00405



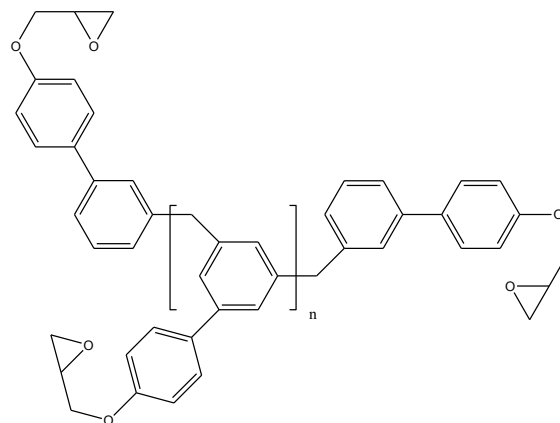
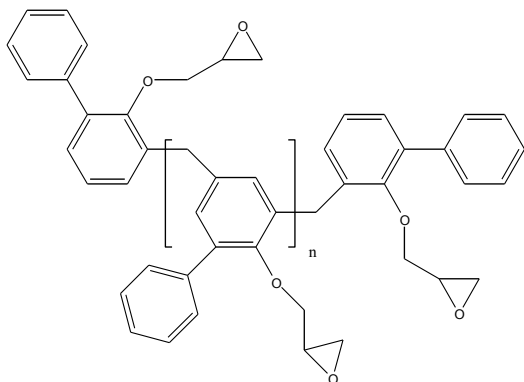
High Tg Epoxy



High Tg Epoxy Resin

SHIN-A T&C Epoxy Resin

Solid Epoxy



SE-5000, 5555

- o-phenylphenol, p-phenylphenol Novolac Epoxy Resin
- Low Dk, Df, high Tg
- Mesogen Structure (Good Thermal Conductivity)

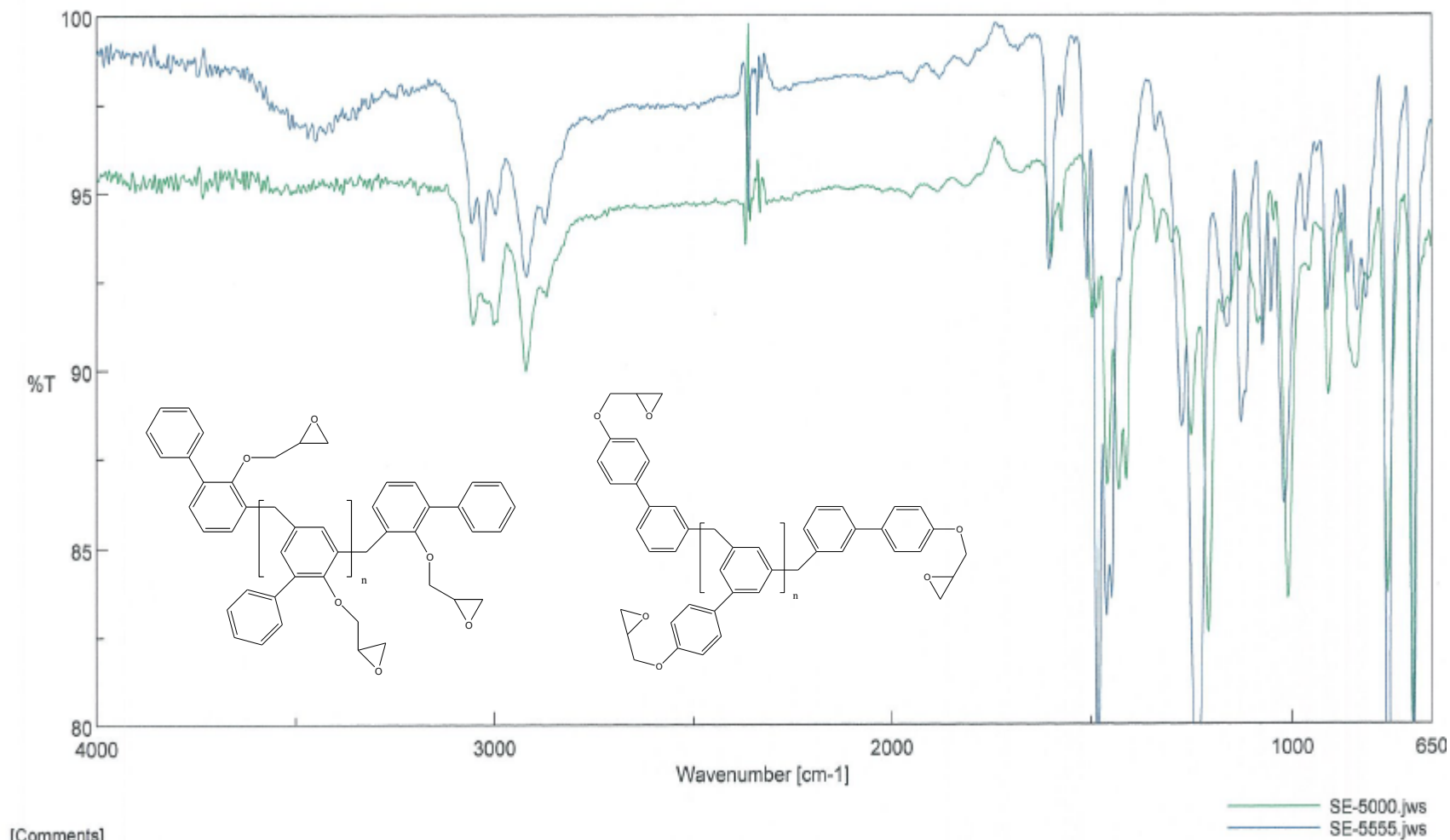
Grade	E.E.W(g/eq)	Hy-Cl	T-Cl	Tm(DSC)	S.P(B&R)	Features
SE-5000	240 - 280	0.05% Max.	0.1% Max.	60-70°C	90-100°C	oppn
SE-5555	300 - 350	0.05% Max.	0.1% Max.	55-65°C	85-95°C	pppn

Geltime Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 170°C



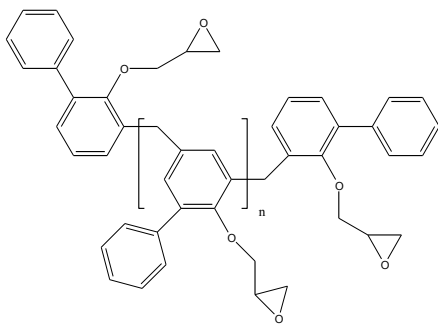
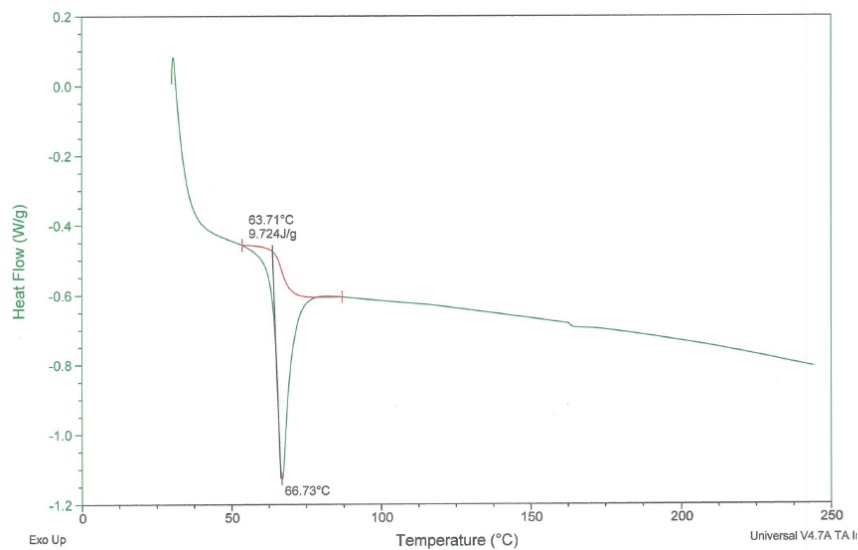
High Tg Epoxy Resin

IR CHART (SE-5000, 5555)

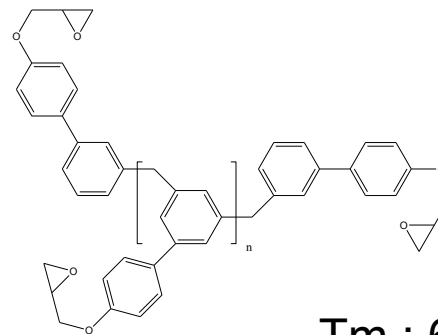
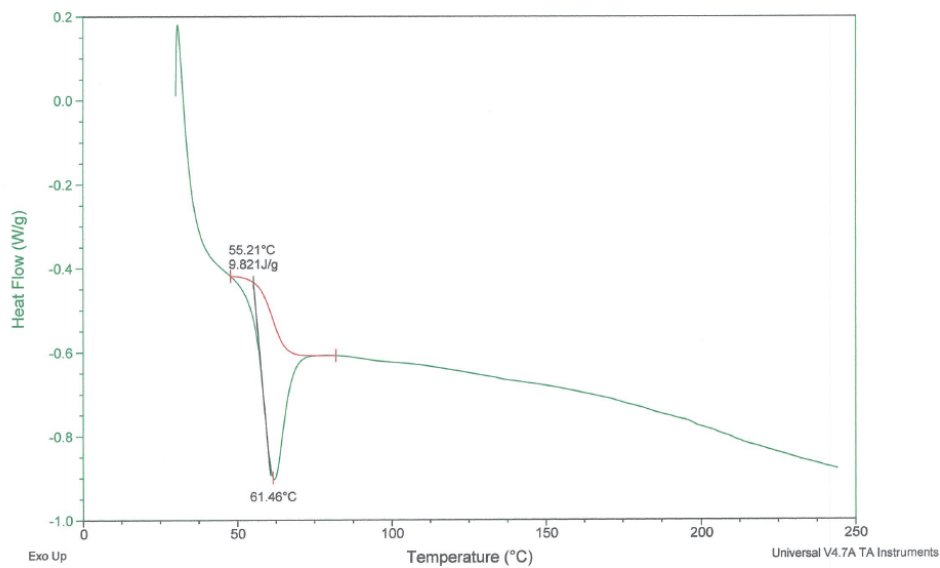


[Comments]

Tm (SE-5000, 5555)



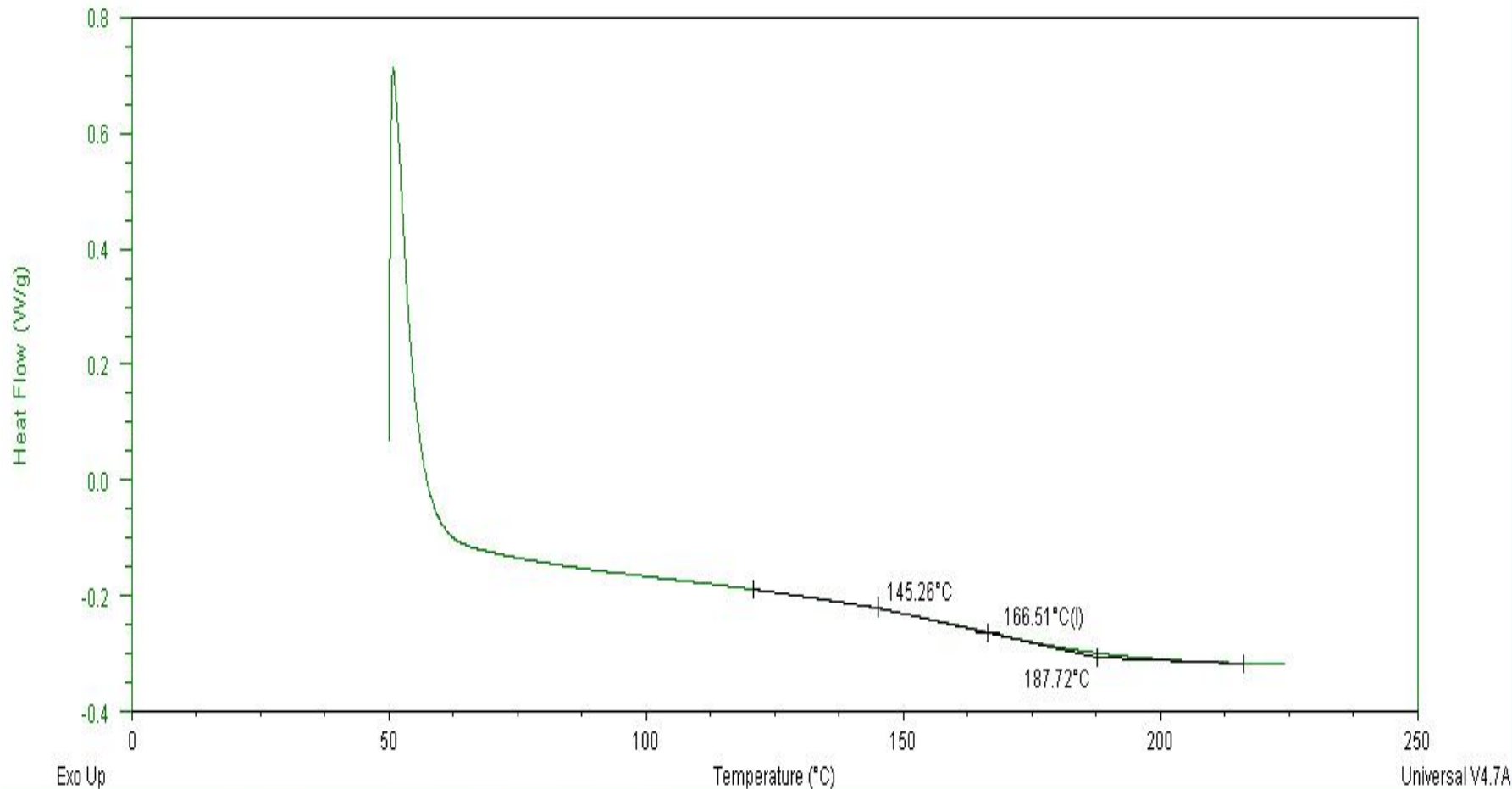
Tm : 66.73 °C



T_m : 61.46 °C

High Tg Epoxy Resin

Tg (SE-5000) – Reference Data



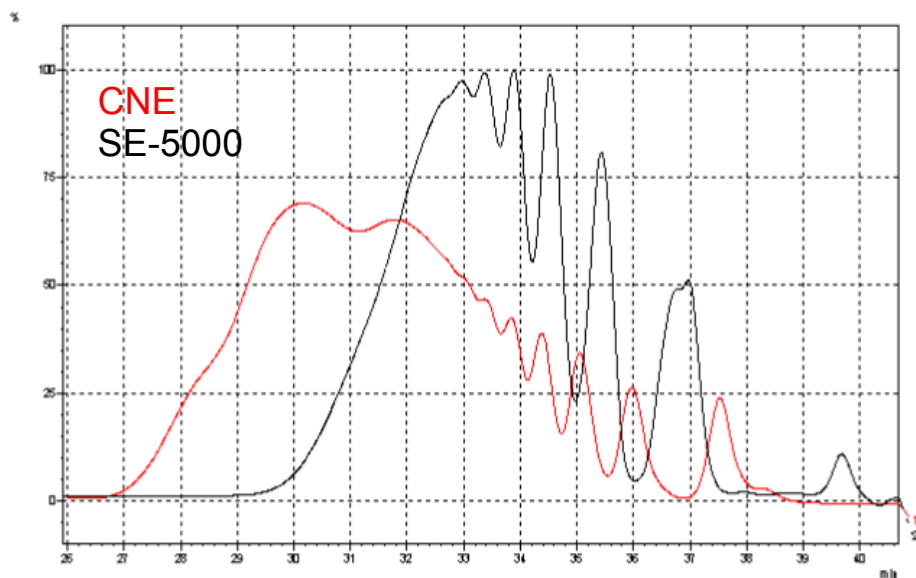
Curing Condition : Phenol Novolac (Hardner), 2E4MZ 1Phr, 180°C x2hr



High Tg Epoxy Resin

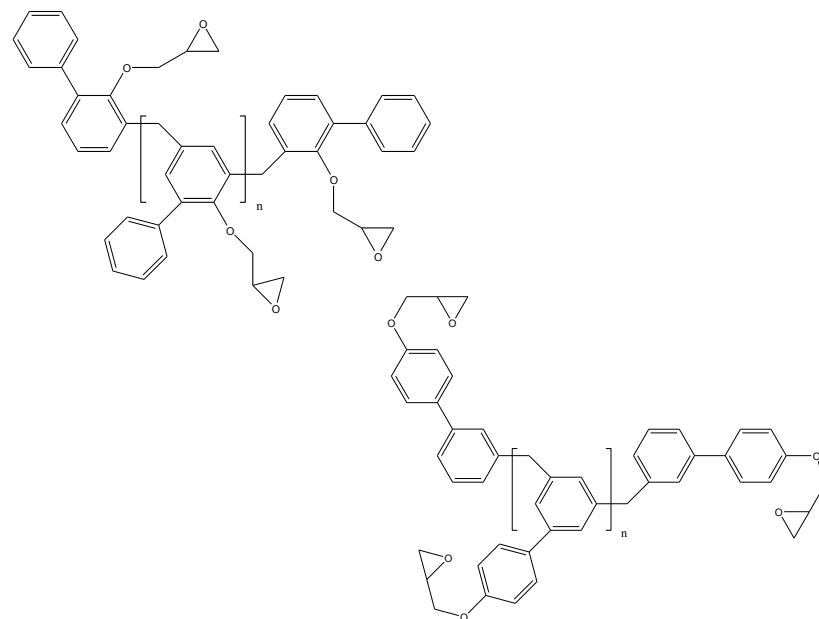
GPC Data (SE-5000, 5555)

==== GPC Data Comparison (Ratio) ====



Detector A Ch1

Peak#	Ret. Time	Height	Area	Area %
1	32.964	9223	972629	42.952
2	33.369	9405	251763	11.118
3	33.882	9478	271038	11.969
4	34.527	9378	280779	12.400
5	35.433	7618	241402	10.661
6	36.775	4580	116124	5.128
7	36.962	4771	109137	4.820
8	37.935	65	1244	0.055
9	38.756	29	693	0.031
10	39.677	888	19620	0.866
Total		55435	2264430	100.000

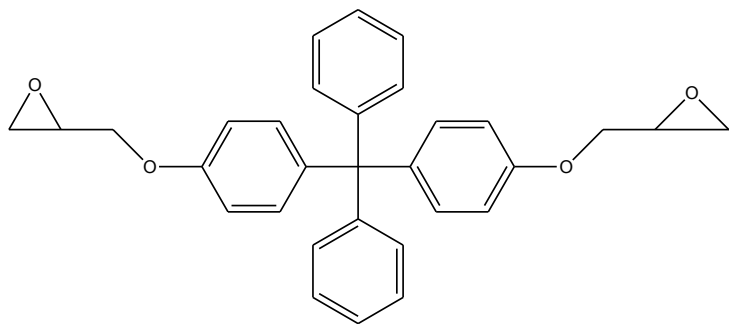


ITEM	n=0	MW	Mn	MWD
CNE	44.0	3,754	1,379	2.72180
SE-5000	42.6	1,175	811	1.44889
SE-5555	34.6	1,106	648	1.70750

High Tg Epoxy Resin

SHIN-A T&C Epoxy Resin

Crystalline Epoxy



SEB-300 (pilot Testing)

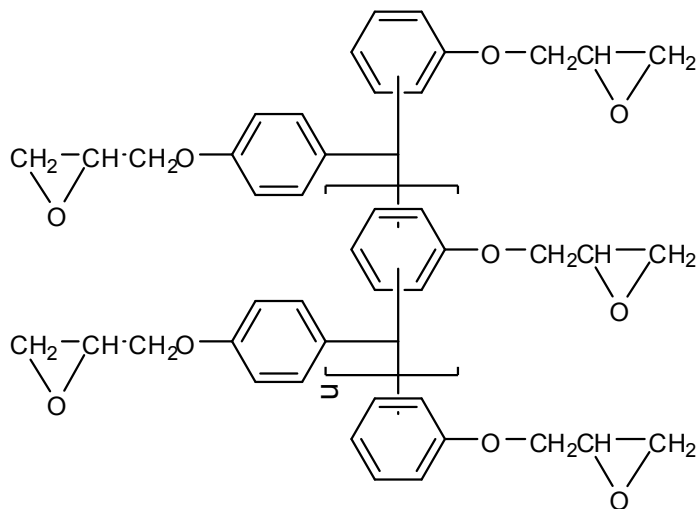
- 4,4'-(diphenylmethylene)bis-Phenol Epoxy Resin
- High Tg, Good Adhesion
- Low Viscosity
- High Tg

Grade	E.E.W(g/e q)	Hy-Cl	T-Cl	Tg(DSC)	Tm(DSC)	S.P (B&R)	Features
SEB-300	240 - 280	0.02% Ma x.	0.1% max.	170-180°C	N.D	50-65°C	Bisphenol

High Tg Epoxy Resin

SHIN-A T&C Epoxy Resin

self-extinguishing & high Tg

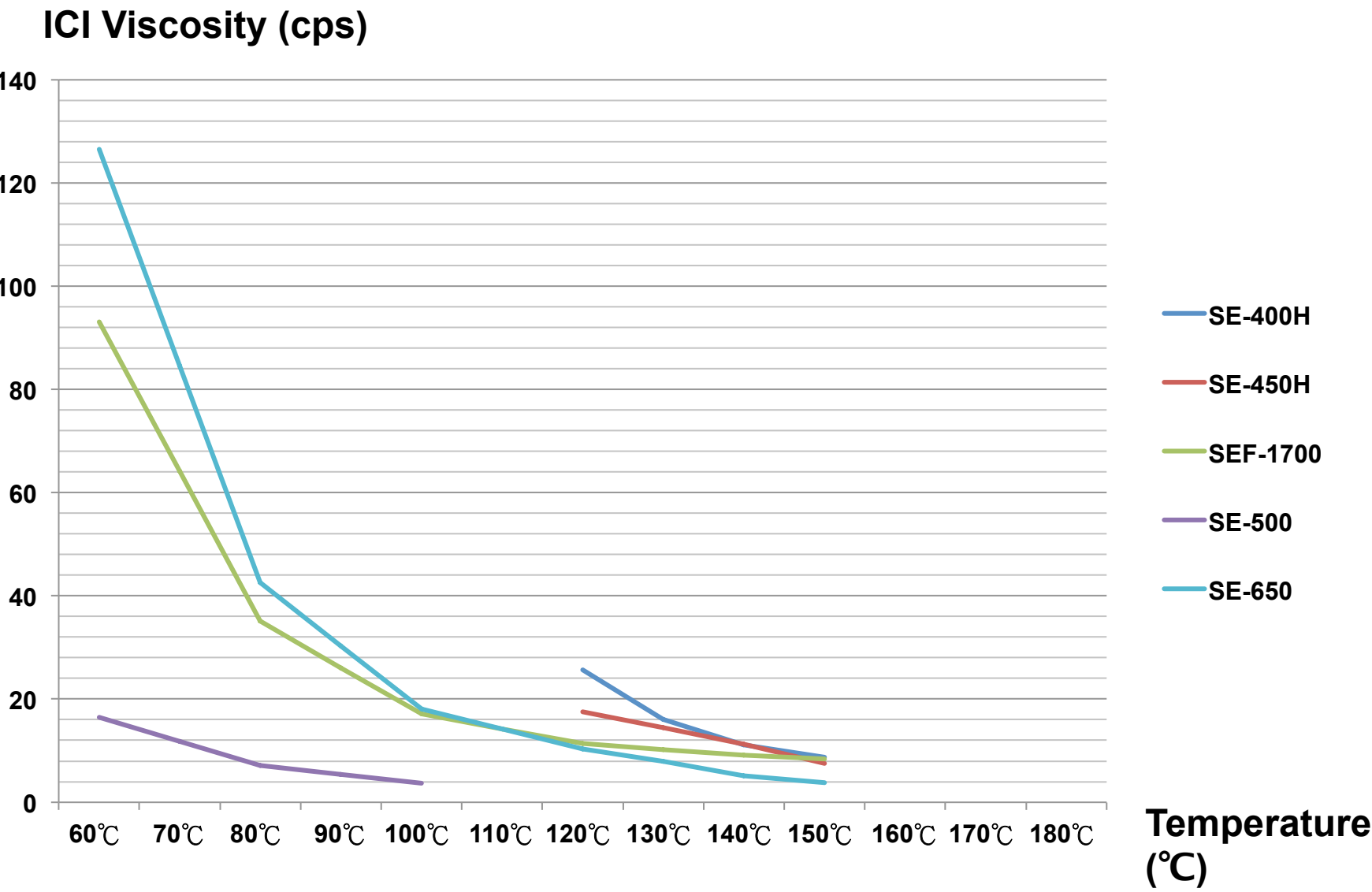


SCT-150
- High Tg, low viscosity, Flame retardancy

Grade	E.E.W(g/eq)	Hy-Cl	T-Cl	S.P (B&R)	Features
SCT-150	150 - 200	0.05% Max.	0.1% Max.	70-85°C	TPM

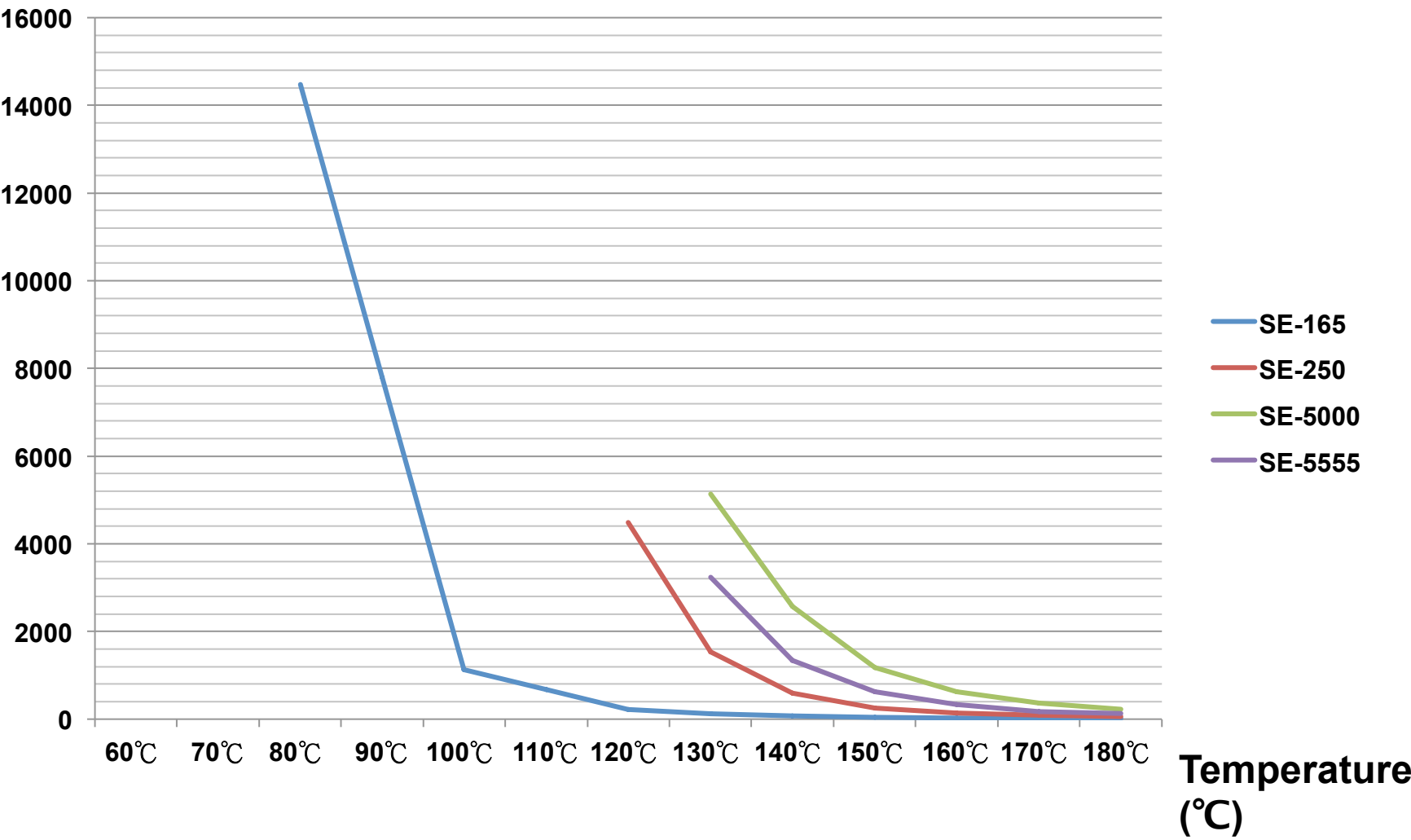


New Epoxy Resin for EMC



New Epoxy Resin for EMC

ICI Viscosity (cps)



New Epoxy Resin for EMC

Shin-A T&C EMC Series Line up (Specification)

Product	No.	Unit	SE-500		SE-555		SE-250		SE-165	
			Spec	1041024 J008	Spec	2041294 S001	Spec	1111269 S001	Spec	1031217 S001
EEW	ASTM D1652	g/eq	200-300	239.6	200-300	239.7	230-270	246.3	220-250	233.2
Hy-Cl	ASTM D1726	ppm	500 Max.	68	500 Max.	93.6	500 Max.	321	500 Max.	165
T-Cl	ASTM D7359	ppm	1000 Ma x.	730	1000 Ma x.	676	1000 Ma x.	851	1000 Ma x.	726
ICI Visco sity(150 °C)	ASTM D4287	cps	20 Max.	16.5 (60°C)	20 Max.	3.4 (100°C)	400 Max.	246	100 Max.	48.8
Tm	ASTM D3417/ D3418/ E1356	°C	N.A	N.A	85-100	92.43	55-70	63.32	N.A	N.A
S.P	ASTM E28-67	°C	N.A	N.A	85-100	93.3	75-90	83.2	55-70	63.8



New Epoxy Resin for EMC

Shin-A T&C EMC Series Line up (Specification)

Product	No.	Unit	SE-5000		SE-5555		SEB-300
			Spec	1110125S 001	Spec	2041300S 001	Spec(Pilot)
EEW	ASTM D1 652	g/eq	240-280	254.3	300-350	335	240-280
Hy-Cl	ASTM D1 726	ppm	500 Max.	469	500 Max.	164.7	500 Max.
T-Cl	ASTM D7 359	ppm	1000 Max.	972	1000 Max.	717	1000 Max.
ICI Viscosi ty (150°C)	ASTM D4287	cps	2000 Max.	1170	1500 Max.	622	N.D
Tm	ASTM D3 417/D341 8/E1356	°C	60-70	66.73	55-65	61.46	N.D
S.P	ASTM E28 -67	°C	90-100	94.0	85-95	91.2	N.D



Epoxy Resin for EMC

Epoxy Resin Trend

