



EF CHEM  
ECO FRIENDLY CHEMICAL

## Chemical Solution Leader

### Leading the Chemical Market with **Customers**

EF CHEM was founded in 1998 and has grown to do business with major chemicals in paint, ink, and adhesives in Korea.

In 2005, we established a branch office in China, and we are expanding our market overseas.

Through the experienced know-how and the accumulated networks last 20 years, EF Chem has provided the competitive chemicals and the effective solutions such as new material development. And overseas marketing activities also are serviced to domestic and foreign customers.

We will do our best to be satisfied with our customers, and furthermore our society.

Thank you.

CEO *JH Choi*

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## 01 Introduction

Vison

Organogram

E c o F r i e n d l y C h e m i c a l



# Vision

Eco Friendly  
Chemical



## Chemical Solution Leader

to lead the market with Customers



### Trust

Orient the sustained growth  
and satisfaction of  
employees and customers  
with true relationship



### Eco-Friendly

Provide the fast solution  
to local customers  
responding to various regulation



### Future

Be together to achieve  
the successful future of  
employees and customers



# Organogram

Eco Friendly  
Chemical



Yantai

Busan





## 02 Business Area

Raw Materials

Marketing

Testing Equipment



# Business Area

Eco Friendly  
Chemical



Raw Materials



Marketing



Test & Production Equip.

- ✓ EF Chem contribute the cost saving to many customers as dealing customer-oriented raw materials late 20 yrs.
- ✓ EF Chem helps the customers' business success providing marketing service in China, South-East Asia and Korea.
- ✓ Our major is to design the customers' cost engineering as sourcing competitive materials.
- ✓ We are trying to supply the competitive items through continuous development and proactive sales.
- ✓ The reliable and cost-competitive testing equipment is supplied to minimize the external calibration cost.
- ✓ EF Chem does the best to be your best partner for providing the proven and competitive machineries, and leads the maximized ROI with minimum investment.





## FR Materials

Phosphorous FR

APP (Ammonium Polyphosphate)

ADP, AHP

Pentaerythritol

Di-pentaerythritol

Melamine

FR Plasticizers

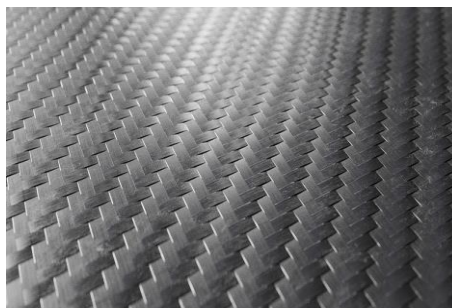
FR Curing Agent for Epoxy



## Fibers

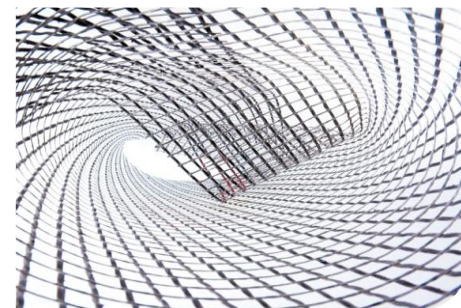
Chopped Carbon Fiber

Aramid Pulp



## Reinforcement

Reinforcement Mesh  
(3 types)





### Ammonium Polyphosphahte (APP)

Use : Fire Retardant

CAS No. : 68333-79-9

Item	Specification
P Content (w/w, %)	31.0-32.0
N Content(w/w, %)	14.0-15.0
PH value (10% suspension)	5.5-7.5
Moisture (w/w, %)	≤0.25
Decomposition Temperature (°C)	≥260
Density (25 °Ckg/L)	~1.9
Bulk Density (25 °Ckg/L)	~700
Viscosity (25 °C, 10% suspension Mpa.s)	≤50
Solubility (g/100m <sup>3</sup> water)	≤0.5
Average Particle Size (D <sub>50</sub> ,μm)	12-25

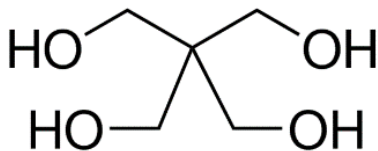


### Pentaerythritol

CAS No. 115-77-5

Molecular Formula  $C_5H_{12}O_4$

It is mainly used for resins, radiation curing monomers, polyurethanes, rosin esters, synthetic lubricants and pigment treatment.



Item	Specification
Appearance	White crystalline odorless solid or powder
PE wt ≥ (%)	95
Hydroxyl value ≥ (%)	47.5
Moisture wt ≤ (%)	0.5
Ash ≤ (%)	0.10
Phthalic Color ≤	2



### Di-pentaerythritol

CAS No. 126-58-9

Molecular Formula  $C_{10}H_{22}O_7$

It is mainly used in used in the manufacture of resins, plasticizers, synthetic lubricants, PVC stabilizer and Acrylic monomers for UV curing system.

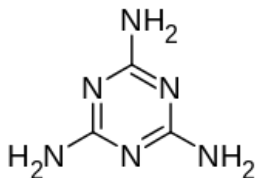
Items	High-class	First-class	Qualified
Content of Di-penta (wt%)	$90.0 \leq$	$87.0 \leq$	$85.0 \leq$
Content of Mono-penta (wt%)	$\leq 3.0$	$\leq 4.0$	$\leq 5.0$
Content of Tri-penta (wt%)	$\leq 5.0$	$\leq 7.0$	$\leq 10.0$
Hydroxyl Value (%)	$\leq 38.0 \sim 40.0$	$\leq 38.0 \sim 40.0$	$\leq 37.0 \sim 41.0$
Melting Point (°C)	205 ~ 224	205 ~ 224	205 ~ 224
Moisture (wt%)	$\leq 1.0$	$\leq 1.0$	$\leq 1.5$
Ash (wt%)	$\leq 0.05$	$\leq 0.10$	$\leq 0.20$
Phthalic Color (Fe, Co, Cu)	$\leq 1$	$\leq 2$	$\leq 4$



### MELAMINE

CAS No. 108-78-1

Molecular Formula  $C_3H_6N_6$



QC Item	Specification
Purity	$99.5\% \leq$
Ash	$\leq 0.03\%$
pH value	7.5 ~ 9.5
Water content	$\leq 0.1\%$
Hazen (Kaolin Turbidity)	$\leq 20$
Color (Pt-Co No.)	$\leq 20$





### FR P-Plasticizer

#### WSFR-71B

WSFR-71B is used as a non-halogen flame retardant plasticizer, whose superiority is demonstrated in very low scorch, low volatility, excellent hydrolytic stability, low fogging, It is recommended as flame retardant plasticizer in PVC, PC/ABS, modified PPO and PC/ABS alloys.

Item	Specification
CAS No.	68937-40-6
Molecular Formula	Mixture
Appearance	Colorless to yellowish transparent liquid
Odor	≤ Slightly
Color (APHA)	≤ 0.1
Acid Value (mg KOH/g)	≤ 0.1
Water content (wt. %)	0.10
Density (25°C, g/m <sup>3</sup> )	1.182 ± 0.005
Viscosity (25°C, mPa·s)	65 ~ 75



### Chopped Carbon Fiber- T70-N



EF Chem chopped carbon fibers are created through precision cutting of our continuous carbon fiber tows and are available with epoxy sizing and in various cut lengths. They are especially popular as a reinforcing material or filler. As a functional additive, our chopped carbon fibers are primarily used in the manufacture of compounds for thermoplastic injection molding processes in the high- and low-temperature ranges. In addition, they are ideally suited for turning non-conductive materials such as plastics, resin systems and special papers into conductive ones.

Go to EF Chem : <http://efchem.co.kr/>

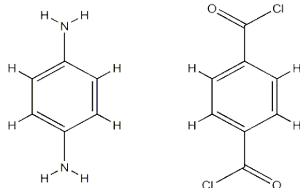
Item	Specification
CAS No.	7440-44-0
Density	1.80 g/m <sup>3</sup>
Fiber length chopped	3.0±0.5 mm/
Filament diameter	7 μm
Tensile strength	4.0 GPa
Tensile modulus	240 GPa
Elongation at break	1.7 %
Single filament resistivity	15 μΩm
Moisture Content	0.5% under
Bulk density	440±5 g/Lt
Sizing type	Epoxy
Sizing level	1 %



### Aramid Fiber

Use: Thixotropic fiber for PFP  
CAS No. : 26125-61-1

Aramid Pulp, pulp-like fibrillated aramid fiber, is well applied as reinforcement material in the formulation of composites for the production of friction material, sealing material and speciality paper. Labon's aramid pulp features good power-retaining capability. It helps improve processing property which leads to stable friction coefficient in high-temperature area for friction material.



Item	Specification
Appearance	Yellow fibrous pulp-like
Fiber length distribution	0.8~1.6 mm
Specific surface area	9~14 m <sup>2</sup> /g
Moisture content	4~8 %



EF Chem pioneers to Korean market for PFP reinforcement, which has entirely depended on import from sole supply.



We develop and supply the performance proven and certified meshes with cost-competitiveness, so that EF Chem leads to enhance the customer's profit.

In addition, we contribute to improve the customer's reputation by maximizing the end-user's satisfaction in field by performance improvement through the technical collaboration between EF Chem and customers.

Now EF Chem is continuously developing the mesh to meet the needs of end-user, and this will achieve to improve the fire performance of PFP system and lead easy application.

EF Chem will be your best partner in PFP market.



MESH-1		MESH-2		MESH-S	
Carbon fiber (6K)	46%	Carbon fiber (12K)	96%	Carbon fiber (50K)	98%
Glass fiber	35%	Polyester	4%	Polyester	2%
Polyester	19%				
Opening 10mmX10mm		Opening 10mmX10mm		N/A	
Width 1,270mm		Width 1,270mm		Width 1,270mm	
					





### Pigments / Fillers

TiO<sub>2</sub> ex. KRONOS

Color pigments

Talc

Gypsum



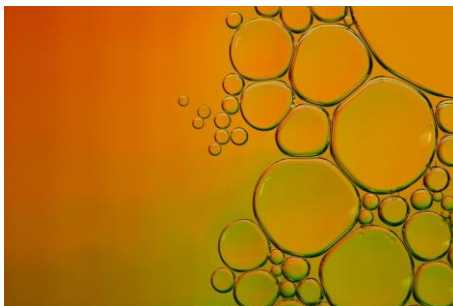
### Resins / Oils

Hydrocarbon resin (C5 & C9)

PVB (Polyvinyl butylar)

Soya Lecithin

Soybean fatty acid



### Specialties

UV Additive (LS-292)

Sodium p-Styrenesulfonate

Caesium carbonate

UV curable resin

PI(Cationic photoinitiator)





## Product Range - All kinds of TiO<sub>2</sub>

CAS NO : 13463-67-7

### Kronos 2090

Item	Specification
Surface treatment	Aluminium compounds
TiO <sub>2</sub> content (DIN EN ISO 591)	≥ 95.0%
Density (DIN EN ISO 787-10)*	4.1g/cm <sup>3</sup>
Bulking value*	0.0293 gal/lb
Oil absorption (DIN EN ISO 787-5)*	18 g/100g pigment
Color Index	Pigment White 6 (77891)

\* Typical value



## KRONOS

### Kronos 2360

Item	Specification
Surface treatment	Al and silicon compounds
TiO <sub>2</sub> content (DIN EN ISO 591)	≥ 92.0%
Density (DIN EN ISO 787-10)*	3.9g/cm <sup>3</sup>
Bulking value*	0.0304 gal/lb
Oil absorption (DIN EN ISO 787-5)*	19 g/100g pigment
Color Index	Pigment White 6 (77891)



## TiO<sub>2</sub> (Cost-Competitive)

Use: TiO<sub>2</sub>, White pigment, Catalyst  
CAS NO : 13463-67-7

Item	Specification(Typical)
TiO <sub>2</sub> content	93.5%
Rutile	98.5%
Dry Brightness delta L* (Compare against Standard)	Not less than
Tint Strength (TCS)	>2000
Undertone (SCX)	≥3.0
Volatile at 105°C	≤0.5%
Oil Absorption	≤20 g/100g
Resistivity	≥90 Ω·m
pH Value	6.0-9.0



### F3RK

Red Color (C.I. No. 12475)

CAS No. : 2786-76-7

Item	Specification
$\Delta L$	$\leq 1.0$
$\Delta C$	$\leq 1.0$
$\Delta H$	$\leq 1.0$
$\Delta E$	$\leq 1.0$
Tint	100 $\pm$ 5%
Moisture	$\leq 1.0\%$
Water Soluble Matter	$\leq 1.0\%$
Oil Absorption	35 ~ 45 mg / 100g
Electric Conductivity	$\leq 500$ us.cm
Fineness (120 mesh)	$\leq 5.0 \%$
PH Value	6.5 ~ 7.5



### Talc

CAS No. : 1318-59-8

Use : Extender for High Temp and Universal coatings

Item	Specification(Typical)
Whiteness	76 ~ 80
Residue at 500μm	≤ 0.8
LOI	≤ 12
Absorption	23 ~ 35
pH	7 ~ 9

### Gypsum

CAS No. : 14798-04-0

Use : Filler of plastics, rubber, paints, asphalt, etc.

Item	Specification
CaSO <sub>4</sub> Content	98% ≤
Pb content	≤ 0.0002%
Ash content	≤ 0.0002%
F content	≤ 0.005%
Whiteness	90 ≤
Fineness	200 ≤

\* Inspection Standard : HG3293-2008





### Hydrocarbon Resin: C9

CAS No. : 64742-16-1

Use : Binder for coatings

Item	Specification(Typical)
Appearance	Yellow Granule
Color Gardner (Resin: Toluene = 1:1)	$\leq 7$
Softening point	110 ~ 120°C
Acid value, mg KOH/g	$\leq 0.2$
Ash content, %	$\leq 0.04$

### Hydrocarbon Resin: C5

CAS No. : 64742-16-1

Use : Binder for coatings

Item	Specification
Appearance	Yellow Granule
Color Gardner (Resin: Toluene = 1:1)	$\leq 5$
Softening Point	96 ~ 105°C
Melt Viscosity	190 ~ 230 cPs
Ash content, %	$\leq 0.1$
Acid value, mg KOH/g	$\leq 1.0$



### PVB (Polyvinyl butyral resin)

CAS No. : Mainly 63148-65-2

Use : Coatings, Adhesives

Item	Specification (Typical)
Butyral content (wt%)	70 ~ 80
Hydroxyl content (wt%)	18 ~ 22
Acetate content (wt%)	≤ 2
Free acid (wt%)	≤ 1
Volatile (wt%)	≤ 3
Viscosity S <sup>1</sup> )	4



### Soybean Fatty Acid

CAS No. : 61788-66-7

Use : Binder, Alkyd

Item	Specification
Appearance	Yellow Liquid
Color Gardner	3# Max
Acid Value	195 ~ 205 mg KOH/g
Saponification Value	196 ~ 206 mg KOH/g
Iodine Value	115 ~ 130 g I <sub>2</sub> /100g



### Soya Lecithin

CAS No. : 8002-43-5

Use : Binder, Alkyd

Item	Specification (Typical)
Appearance	A light dark brown viscous liquid
Acid Value	$\leq 36$ mg KOH/g
Toluene Insoluble	$\leq 0.3\%$
Acetone Soluble	$\leq 40\%$
Peroxide Value	$\leq 12$ meq/kg
Loss on drying	$\leq 1.5\%$
Viscosity (25°C)	$\leq 10,000$ cP
Color (Lovibond 5¼" cell)	RED Max 18

### Linseed Oil Fatty Acid

CAS No. : 68308-53-2

Use : Binder, Alkyd

Item	Specification
Appearance	Clear liquid
Colour (Lovibond 5¼" cell)	Red Max 2, Yellow Max 15
Acid Value (mg KOH/g)	194 ~ 205
Iodine Value (g I <sub>2</sub> /100g)	165 ~ 180

#### Composition of Fatty Acid

$\leq$ C14:0 : 0~1 % ,	C16:0 : 5~10 % ,	C16:1 : 0~1 % ,
C18:0 : 2~6 % ,	C18:1 : 18~30 % ,	C18:2 : 20~30 % ,
C18:3 : 32~42 % ,	C20 $\leq$ : 0~4 % ,	Others : 0~3 %



UV Absorber

Light Stabilizer

Antioxidant

Optical Brightener

Special Absorber

Medical Intermediate

Flame Retardant

Photoinitiator

Others



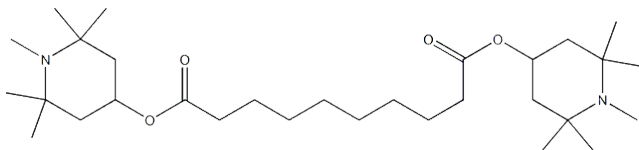


### Light Stabilizer - LS 292

CAS No. 41556-26-7

Molecular Formula  $C_{30}H_{56}N_2O_4$

Bis(1,2,2,6,6-pentamethyl-4-piperidyl) sebacate



LS 292 can effectively prevent cracking, loss of light and other lacquer disease, can significantly improve the service life of the coating, and the product at room temperature will not crystallize.

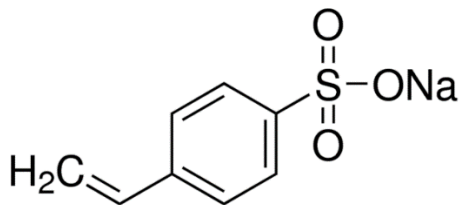
Item	Specification
Characteristics	Colorless or pale transparent liquid
Assay	96.0% ≤
Methyl Sibilate	15~25%
Bis Sibilate	75~85%
Burning Residue	≤ 0.1%
Clarity of solution	≤ 50 Hazen
Volatile matter	≤ 0.50%
Transmittance	425nm : 96% ≤ , 500nm : 98% ≤



### Sodium *p*-Styrenesulfonate

CAS No. : 2695-37-6

Use : Reactive emulsifier, dye modifier, water-soluble polymer (flocculant, dispersing agent, container cleaning agent, cosmetic) , photo agentia(membrane), antistatic agent, semiconductor, image film, heat transfer products and other fields.



Item	Specification
Appearance	White powder
Vinyl Activity (as SSS)	89 ~ 100
Water	8 ~ 12
Color (1% APHA)	≤ 50
pH (10% Aqueous solution)	7.5 ~ 11
Filterable Matter	≤ 0.06
Sodium Sulfate	≤ 0.8
Halides	≤ 6
Light Absorbance /cm at 600nm	≤ 0.035
Iron	≤ 15 ppm

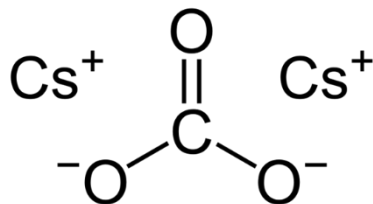


## Cesium Carbonate

CAS No. : 534-17-8

Use : Preparation of various base materials of strontium salt,

Catalyst, Electronic layer for OLED



Cs <sub>2</sub> CO <sub>3</sub>	Impurities Max ppm									
	Li	K	Na	Ca	Mg	Fe	Al	Si	Rb	Pb
99.9 min%	5	50	50	30	5	10	50	50	200	5



### UV curable resin/UV monomer

CAS No. : 18934-00-4, 298695-60-0

Use : Active diluent of cationic UV-curing

UV-curable resin

cationic curable additive

cationic curable additive for epoxy resin

Item	Specification (18934-00-4)	Specification (298695-60-0)
Appearance	Colorless to Yellowish Clear Liquid	Colorless to Yellowish Clear Liquid
Purity	≥98.0	≥98.0
Water Content	≤1000ppm	≤500ppm

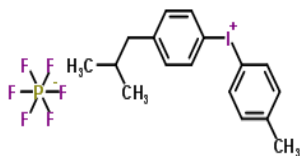


### PI(Cationic photoinitiator)

CAS No. : 344562-80-7

Use : Cationic photoinitiator

It can be used to effectively cure cationic inks and coatings, e.g., printing inks, white base coatings and adhesives.



Item	Specification
Appearance	Yellow to brown Liquid
Content	75% solution of this product in propylene carbonate
Melting point	64.0~67.0°C
Absorption peak	250mm, 340mm(in Methanol solution)



# Marketing

Eco Friendly  
Chemical



## Market Survey

EF Chem helps the customers' business success providing marketing service in China, South-East asia and Domestic.

## RM Sourcing

We contribute to design the customers' cost engineering as sourcing competitive materials.

## Item Development

We are trying to supply the competitive items through continuous development and proactive sales.



## 03 Our Customers



## Our Customers

Eco Friendly  
Chemical



한두화이어코트  
HANDOO FIRE COTE CORP.



KKP 금강페인트 공업 (주)



삼화페인트





## 04 Contact

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