Global Contacts

AGC CHEMICALS
Essential Chemicals General Division
Polyurethanes Division
Shin-Marunouchi Building
1-5-1, Marunouchi, Chiyoda-ku
TOKYO 100-8403, JAPAN
Tel : +81-3-3218-5404
Fax : +81-3-3218-7845
http://www.agc-chemicals.com

AGC CHEMICALS AMERICA, INC
2201 Water Ridge Pkwy, Suite 400
Harlotte, NC 28217, USA
Tel : +1 704-329-7603
Fax : +1 704-357-6308
http://www.agcchem.com

AGC CHEMICALS EUROPE, LTD
Commercial Centre
Zuidplein 80
1077 VX Amsterdam, The Netherlands
Tel : +31 (0)20-880-4170
Fax : +31 (0)20-880-4188
http://www.agcche.com

AGC Asia Pacific Pte Ltd
460 Alexandra Road
PSA Building #32-01,
Singapore 119963
Tel : +65-6273-5856
Fax : +65-6271-3817
http://agc-asiapacific.com
AGC Polyurethanes Division

AGC produces polyether polyols integratedly for the polyurethane industry from Propylene Oxide (PO), the major raw material for the production of polyols, so that we can supply products to customers stably.

AGC started producing polyether polyols in 1975, and then we developed high molecular weight & ultra-low monol content polyether polyol (PREMINOL™). Furthermore, we enhanced its features (PREMINOL™S) and developed them for various applications. AGC also produce and commercialize silane modified polyether (EXCESTAR™) as the moisture-curable polymer based on the PREMINOL™ technology.

Vertically integrated production system from upstream to downstream

PREMINOL™
Polyether polyols for CASE applications and polyurethane foam
AGC has high molecular weight and ultra-low monol content polyether polyols (PREMINOL™) which are produced by our unique catalyst technology. PREMINOL™ gives good performances in the mechanical properties, workability, and environmental characteristic to the CASE* products. PREMINOL™ is applied for various applications like NCO terminated prepolymer, urethane acrylate and silane terminated polyurethane by modifying reactive groups.

*CASE: Coating, Adhesive, Sealant, Elastomer

EXCESTAR™
Silane modified polyether for sealant and adhesive
EXCESTAR™ is liquid polymer for silane modified polyether sealant and adhesive. Its unique properties such as high flexibility, safety and non-staining property enable EXCESTAR™ to apply at various markets including: Construction, Industrial and Electronics.

PREMINOL™ / EXCESTAR™ APPLICATIONS

Construction
- Sealant
  - Polyurethane
  - Silane modified polyether
  - Plasticizer

- Adhesive
  - Polyurethane
  - Silane terminated polyurethane
  - Silane modified polyether

Industrial
- Adhesive for Automotive, Train, Elevator
  - Polyurethane
  - Silane terminated polyurethane
  - Silane modified polyether

Electronics
- UV curable adhesive or OCR
  - Urethane acrylate
- Pressure sensitive adhesive for protecting film
  - Silane terminated polyurethane
**PREMINOL™**

High molecular weight & Ultra-low monol content polyether polyol

**CH₃**

**H₂**

**O**

**OH**

---

**PROPERTIES**

- **Ultra-Low monol content**
  - Good mechanical properties, Fast curing
  - monol : by-product

- **High molecular weight**
  - High flexibility, Good durability

- **Narrow molecular weight distribution**
  - Good workability

---

**APPLICATIONS**

PREMINOL™ can be applied to a wide variety of curable polymers, by modifying terminal hydroxyl groups.

- NCO terminated prepolymer
- Urethane acrylate
- Silane terminated polyurethane
- Silane modified polyether (EXCESTAR™)

---

**PERFORMANCE ADVANTAGES**

**Good mechanical properties**
- High flexibility and high cohesive force are suitable for elastic adhesive.

**Good durability**
- High mechanical strength and high elongation enable to provide high durability sealants

**Good workability**
- Low viscosity of formulation enables to seal easily even at low temperature.

**Fast curing**
- Fast cure enables to shorten the total process time.

**Environmentally friendly (Plasticizer free, Solvent free)**
- High flexibility and low viscosity polymer enables to reduce the amount of plasticizer and solvent in the formulation

---

**Comparison of Molecular weight distribution and monol content**

**Comparison of calculated functionalities between PREMINOL™ S and Conventional Polyether Polyol**
PREMINOL™ APPLICATION: Construction / Industrial

PU Adhesive / Sealant (PU: Polyurethane)

PERFORMANCE ADVANTAGES
- High cohesive force
- Good workability

APPLICATIONS
Construction
- House / Building
  - Siding panel sealant (ALC panel, sash, etc.)
  - Reinforced Concrete wall joint sealant
  - Floor adhesive
  - Decorative panel / Composite panel adhesive

Industrial

Hybrid Adhesive / Sealant

PERFORMANCE ADVANTAGES
- Environmentally friendly
- Fast curing
- Good adhesion
- Good flexibility
- Good workability

APPLICATIONS
Construction
- House / Building
  - Various interior materials adhesive

Industrial
- Transportation
  - Automotive interior and exterior adhesive
  - Container sealant
  - Elevator assembly adhesive
PREMINOL™ APPLICATION: Electronics

**UV Curable Adhesive**

**PERFORMANCE ADVANTAGES**

- Low viscosity
- Forming soft membrane
- Good curability
- Low shrinkage and non-volatility

**APPLICATIONS**

**Electronics**

- Electric component adhesive
- OCR/OCA
  (Optical Clear Resin/Optical Clear Adhesive)

**Hybrid Pressure Sensitive Adhesive**

**PERFORMANCE ADVANTAGES**

- Good balance between adhesive force and wettability
- Good workability
- High solid content
- Low rate of adhesive force increase

**APPLICATIONS**

**Electronics**

- PSA for film screen protector of polarization plate, prism and cover glass
  (PSA: Pressure Sensitive Adhesive)
Performance Advantages

Environmentally friendly / Safe
- Solvent free, toxic (amine, isocyanate) free and low VOC material
- Good for interior adhesion such as automotive and construction

Elasticity
- Suitable for an application which requires expansion and contraction, high vibration resistance
- Keeping elasticity for a long time

Good adhesion
- Excellent adhesion for metal, plastics and coating material

Non-staining
- Pollutant (low molecular weight compound) free
- Keeping various adherent (tile, stone, metal panel etc.) clean for a long term

Good weatherability
- Suitable for outdoor use

Good paintability
- Paintable with various kinds of paints

Properties

SMP demonstrates the excellent properties compared with other resin.

<table>
<thead>
<tr>
<th></th>
<th>SMP</th>
<th>Silicone</th>
<th>PU</th>
<th>Epoxy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paintability</td>
<td>Excellent</td>
<td>Poor</td>
<td>Good</td>
<td>-</td>
</tr>
<tr>
<td>Non-staining</td>
<td>Good</td>
<td>Poor</td>
<td>Good</td>
<td>-</td>
</tr>
<tr>
<td>Weatherability</td>
<td>Good</td>
<td>Excellent</td>
<td>Poor</td>
<td>-</td>
</tr>
<tr>
<td>Durability</td>
<td>Good</td>
<td>Excellent</td>
<td>Average</td>
<td>-</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Average</td>
<td>Poor</td>
</tr>
<tr>
<td>Bubble free curing</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>Environmental Characteristic</td>
<td>Excellent</td>
<td>Good</td>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>Storage stability</td>
<td>Excellent</td>
<td>Good</td>
<td>Average</td>
<td>Poor</td>
</tr>
<tr>
<td>Curing rate</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Poor</td>
<td>Average</td>
</tr>
<tr>
<td>Adhesive</td>
<td>Strength Average</td>
<td>-</td>
<td>Good</td>
<td>Excellent</td>
</tr>
<tr>
<td></td>
<td>Adhesion Good</td>
<td>-</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

Features of Excestar™

Excestar™ has multiple advantages compared with silane terminated polyurethane.

- Elongation
- Heat resistance
- Weatherability
- Storage stability and production stability
EXCESTAR™ APPLICATION

**Construction**

**House**
- Metal roof sealant
- Exterior / Interior sealant
- Interior adhesive (flooring, wall, ceiling)

**Building**
- Metal/pre-cast concrete curtain wall joint sealing
- Reinforced Concrete joint sealing

**Industrial**

**Automotive**
- Interior materials adhesive
- Millar/window shield adhesive

**Train**
- Interior adhesive
- Joint sealing (panel, glass)

**Elevator**
- Panel adhesive

**Electronics**
- Electronics component adhesive

---

EXCESTAR™ & PREMINOL™ APPLICATION

**Performance Advantages**

- Non-staining
- Excellent paintability
- Environmentally friendly

**Formulation**

<table>
<thead>
<tr>
<th></th>
<th>EXCESTAR™</th>
<th>Plasticizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 - 40%</td>
<td>10 - 20%</td>
<td>1 - 2%</td>
</tr>
<tr>
<td></td>
<td>40 - 60%</td>
<td>water scavenger</td>
</tr>
<tr>
<td></td>
<td>2 - 4%</td>
<td>fillers (calcium carbonates)</td>
</tr>
<tr>
<td></td>
<td>0.1 - 10%</td>
<td>silane coupling agent, antioxidant, ultraviolet absorber etc.</td>
</tr>
</tbody>
</table>

**Properties**

PREMINOL™ is suitable for a plasticizer combined with SMP sealant.

<table>
<thead>
<tr>
<th></th>
<th>PREMINOL™ A</th>
<th>PREMINOL™ B</th>
<th>Conventional PPG</th>
<th>DINP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular weight</td>
<td>Average</td>
<td>High</td>
<td>Average</td>
<td>Low</td>
</tr>
<tr>
<td>Environmentally friendly</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Workability</td>
<td>Good</td>
<td>Average</td>
<td>Good</td>
<td>Good</td>
</tr>
<tr>
<td>Non-Bleed (Resistance to Staining)</td>
<td>Good</td>
<td>Excellent</td>
<td>Poor</td>
<td>Good</td>
</tr>
<tr>
<td>Appearance (After Staining Test)</td>
<td>Good</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
</tr>
</tbody>
</table>

---

**Staining Mechanism**

- Paint film
- Sealant
- Plasticizer
- Dust
AGC Group
Look Beyond
To make the world a brighter place

The AGC Group strives to be a company trusted by all its stakeholders, a company that meets the expectations of the world business community to grow and develop responsibly, and a company that slightly contributes to a healthier global society.

AGC Inc.
September 8, 1907

AGC Group’s Global Network
AGC Group has sales and production sites in more than 30 countries.

AGC Chemical’s Global Network
- We have many sales and production sites.
- We can offer technical support all over the world.

Chemical chain
- Chlorine
  - Caustic soda
  - Hydrochloric acid
  - Sodium hypochlorite
  - Sodium hydroxide
- Chloroform
  - Fluorinated gas recovery and processing
- HCFC-22
  - Refrigerants
- Tetrachloroethylene
  - Fluorinated water and oil repellents

Business Overview
- AGC Group consists of 4 companies: Glass, Chemicals, Electronics, and Ceramics.
- Each company has unique technology and develops many kinds of products.