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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 produces and commercializes 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, Eustomer

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
**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

**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™)

**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

![Comparison of Molecular weight distribution and monol content](image1)

![Comparison of calculated functionalities between PREMINOL™S and Conventional Polyether Polyol](image2)
**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**
- Automotive
  - Various interior materials adhesive

**Hybrid Adhesive / Sealant**

PERFORMANCE ADVANTAGES

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

APPLICATIONS

**Construction**
- House / Building
  - Floor (wood, concrete) adhesive
  - Decorative panel / Composite panel adhesive

**Industrial**
- Transportation
  - Automotive interior and exterior adhesive
  - Container sealant
  - Elevator assembly adhesive
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 adherend (tile, stone, metal panel etc.) clean for a long term

Good weatherability
- Suitable for outdoor use

Good paintability
- Paintable with various kinds of paints

FEATURES OF EXCESTAR™
EXCESTAR™ has multiple advantages compared with silane terminated polyurethane.

- Elongation
- Heat resistance
- Weatherability
- Storage stability and production stability

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>
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</thead>
<tbody>
<tr>
<td>Sealant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<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>
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<tr>
<td>Weatherability</td>
<td>Good</td>
<td>Excellent</td>
<td>Poor</td>
<td>-</td>
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<tr>
<td>Durability</td>
<td>Good</td>
<td>Excellent</td>
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<tr>
<td>Flexibility</td>
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<td>Poor</td>
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<td>Bubble free curing</td>
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<td>Poor</td>
<td>Excellent</td>
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<td>Environmental Characteristic</td>
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<td>Poor</td>
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<tr>
<td>Storage stability</td>
<td>Excellent</td>
<td>Good</td>
<td>Average</td>
<td>Poor</td>
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<tr>
<td>Curing rate</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Poor</td>
<td>Average</td>
</tr>
</tbody>
</table>

Adhesive
- Strength: Average
- Adhesion: Good

EXCESTAR™
Silane terminated polyurethane
Silane terminated polyurethane (Prepolymer type)
- Polyether
- Silane
- Urethane / Urea Bond
**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

**EXCESTAR™ & PREMINOL™ APPLICATION**

**Performance Advantages**
- Non-staining
- Excellent paintability
- Environmentally friendly

**Formulation**
- 20 - 40% **EXCESTAR™**
- 10 - 20% plasticizer
- 1 - 2% water scavenger
- 40 - 60% fillers (calcium carbonates)
- 2 - 4% silane coupling agent, antioxidant, ultraviolet absorber etc.
- 0.1 - 10% catalyst

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

<table>
<thead>
<tr>
<th>Property</th>
<th>PREMINOL™ A</th>
<th>PREMINOL™ B</th>
<th>Conventional PPG</th>
<th>DINP</th>
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<tbody>
<tr>
<td>Molecular weight</td>
<td>Average</td>
<td>High</td>
<td>Average</td>
<td>Low</td>
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<td>Environmentally friendly</td>
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<td>Good</td>
<td>Poor</td>
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<tr>
<td>Workability</td>
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<td>Average</td>
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<td>Good</td>
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<tr>
<td>Non Bleed (resistance to staining)</td>
<td>Good</td>
<td>Excellent</td>
<td>Poor</td>
<td>Poor</td>
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<tr>
<td>Appearance (after staining test)</td>
<td>Good</td>
<td>Excellent</td>
<td>Poor</td>
<td>Poor</td>
</tr>
</tbody>
</table>

**Staining mechanism**
- Paint film
- Sealant
- Plasticizer
- Dust
AGC Group

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

Gas & Solvents Business
- Chlorine
- Chloroform
- HCFC-22

Chlor & Alkali Business
- Potassium carbonate
- Propylene oxide (PO)
- Propylene glycol (PG)
- PREMIONEL™
- EXCESTAR™

Fluoro products Business
- Fluoropolymer
- Fluoroplastics
- Transparent
- Film
- Membrane

AGC Chemicals America
AGC Chemicals Europe