QUALITY PERFORMS.

Blocked Isocyanates
for urethane surface coatings

Trixene® Blocked Isocyanates

QUALITY WORKS. LANXESS Energizing Chemistry
LANXESS, a world leader in polyurethane systems offers blocking technology to enable 1K formulations for crosslinking and adhesion promotion in coating and adhesive applications. Heat cured systems overcome compounding limitations and can help to reduce energy consumption or processing time and provide a safer working environment.

**Benefits of 1K blocked systems**
- Easy formulation
- Superior processing and high productivity
- No handling of free isocyanates

**Heat Curing Mechanism**

Temperature and processing conditions influence the choice of blocked isocyanate. Deblocking takes place under specific curing conditions and allows the isocyanate to react with the polyol component.
DIFFERENTIATED OFFER OF TRIXENE® BLOCKED ISOCYANATE CROSSLINKERS TO MEET CUSTOMER REQUIREMENTS

Heat cure applications require different unblocking temperatures, depending on the type of substrate. LANXESS’ broad portfolio of Trixene® blocked crosslinkers delivers a range of characteristics to suit application parameters, allowing tailoring of coating properties. Our technical team has specific expertise in the formulation and production of high performance DMP, hybrid and water-based blocked isocyanates.

### Debloking Temperatures

<table>
<thead>
<tr>
<th>Blocking Agent</th>
<th>Temp (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMP</td>
<td>124</td>
</tr>
<tr>
<td>MEKO</td>
<td>165</td>
</tr>
<tr>
<td>ε-CAP</td>
<td>196</td>
</tr>
<tr>
<td>DEM*</td>
<td>90-100</td>
</tr>
</tbody>
</table>

*DEM is not shown in the graph as it follows a different unblocking mechanism, requiring more refined evaluation.

### DMP blocked isocyanates for reduced volatility

LANXESS pioneered and patented the use of DMP in blocked isocyanate systems, with proven advantages over other blocking technologies:

- Better resistance to chemical and environmental attack
- Improved color stability and resistance to yellowing, particularly on overbake and UV exposure
- Reduced energy usage due to lower unblocking temperature and/or shortened dwell time
- Reduced VOC emissions and less pinholing of coatings due to lower volatility of blocking agent

### HYBRID blocked isocyanates for greater formulation freedom

Designed in combination with malonate co-crosslinkers to deliver the following benefits:

- Reduced tendency of DEM blocked isocyanates from crystallizing upon standing
- Improved compatibility with OH functional resins

### WATER-BASED blocked isocyanates to meet regulatory demands

Trixene® Aqua products include latent crosslinkers and adhesion promoters which are multifunctional blocked isocyanates dispersed in water, delivering the following characteristics:

- Compliant with increasingly demanding regulations on VOC
- For use with water-based coating systems like polyurethane dispersions
LANXESS is at the forefront of blocked isocyanate technology and our products designed as solvent-borne, water-based and 100% solids meet the requirements of high performance coatings formulations in a wide range of application areas.

**Can and Coil Coatings**

**Trixene®** blocked crosslinkers offer highly flexible coatings with superior durability, weather resistance and easy processing for the can and coil coating industry.

**Trixene® BI 7982** is an aliphatic blocked crosslinker for coil coating formulations; due to its chemical structure formulators can prepare coatings with high durability, weathering stability and high build.

**Benefits**
- Storage stability for 1K formulations
- High flexibility
- Reduced yellowing

**Transportation Coatings**

**Trixene®** blocked crosslinkers enable formation of flexible coatings with high impact resistance and adhesion on a variety of substrates, solving the needs of the transportation industry.

**Trixene® BI 7961** is an aliphatic blocked crosslinker, due to its good adhesion and impact resistance it is optimized for very flexible metal substrates.

**Trixene® BI 7992** offers fast turnaround due to lowest unblocking temperature and good compatibility with hydroxyl-functional resins.

**Benefits**
- Excellent compatibility and high reactivity
- Enhanced chemical resistance
- Lowest deblocking temperature

**Textile Coatings**

**Trixene® Aqua** blocked crosslinkers offer highly flexible coatings with low unblocking temperature for the textile coating industry.

**Trixene® Aqua BI 220** is a water-based crosslinker for 1K stoving coatings for fiber impregnation, enhancing adhesion, tensile strength and washout under severe stress conditions.

**Benefits**
- Low VOC (water-based)
- Low unblocking temperature
- Washout resistance, durability

**Glass and Packaging Coatings**

**Trixene® Aqua** blocked crosslinkers are used to enhance glass coatings, giving the desired protection and aesthetic appearance.

**Trixene® Aqua BI 201** is a water-based crosslinker to formulate 1K glass coating formulations with improved impact and chemical resistance and excellent color retention.

**Trixene® Aqua BI 202** is a MEKO free high temperature unblocking crosslinker, which can be used in glass fiber sizing, offering improved strand integrity, reduced fuzz formation and compatibility to polyamide.

**Benefits**
- Improved scratch resistance
- Enhanced impact resistance
- Chemical resistance
TRIXENE® BLOCKED ISOCYANATES
OFFER SIGNIFICANT BENEFITS
OVER TRADITIONAL CROSSLINKERS

Our range of solvent-borne grades serve mainly as crosslinkers for hydroxyl-functional resins (polyester, urethane, acrylic etc.). They are typically formulated into 1K coatings that are dried and cured under factory stoving conditions, e.g. for OEM metal components used in the automotive and consumer goods industries.

Trixene® Blocked Isocyanates - solvent-borne systems

<table>
<thead>
<tr>
<th>Trixene® Product</th>
<th>Isocyanate Type</th>
<th>Blocking Agent</th>
<th>Viscosity at 25°C (mPa·s)</th>
<th>Equiv. Wt. (as supplied)</th>
<th>Solids (%)</th>
<th>Solvent</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>BI 7641</td>
<td>Aromatic Blocked</td>
<td>TDI prepolymer</td>
<td>DMP</td>
<td>6,250</td>
<td>744</td>
<td>60</td>
<td>PMA/Xylene</td>
</tr>
<tr>
<td>BI 7642</td>
<td>TDI prepolymer</td>
<td>MEKO</td>
<td>25,000</td>
<td>737</td>
<td>60</td>
<td>PMA/Xylene</td>
<td>Coil, transportation, primer/base coat</td>
</tr>
<tr>
<td>BI 7675</td>
<td>TDI prepolymer</td>
<td>MEKO</td>
<td>&lt;2,500</td>
<td>858</td>
<td>65</td>
<td>PMA</td>
<td>Abrasive binder</td>
</tr>
</tbody>
</table>

| Aliphatic Blocked |
|-------------------|-----------------|----------------|------------------|----------------------|------------|---------|-------------|
| BI 7951           | IPDI trimer     | DMP | 3,500 | 539 | 65 | C9 Aromatic/BA | Transportation and coil coating |
| BI 7960           | HDI biuret      | DMP | 1,100 | 410 | 70 | PM/ethyl acetate | Coil and electrodeposition |
| BI 7961           | HDI biuret      | DMP | 2,250 | 410 | 70 | C9 Aromatic | Coil and electrostatic |
| BI 7963           | HDI biuret      | DEM | 4,500 | 477 | 70 | PM | Low temperature curing or higher reactivity |
| BI 7982           | HDI trimer      | DMP | 600 | 410 | 70 | PM | Transportation and coil coating |
| BI 7984           | HDI trimer      | MEKO | 2,000 – 4,000 | 373 | 74 – 76% | Naphtha 100 | Transportation and coil coating |

| Hybrid Aliphatic Blocked |
|-------------------------|-----------------|----------------|------------------|----------------------|------------|---------|-------------|
| BI 7991                 | HDI biuret      | DMP/DEM | 2,000 | 456 | 70 | PM | Transportation and coil coating |
| BI 7992                 | HDI trimer      | DMP/DEM | 1,500 | 456 | 70 | PM | Transportation and coil coating |

Data provided in the table above is characteristic of the product grade, and does not constitute a specification. Further information is given in technical and material safety data sheets for individual Trixene® BI products. Samples, supplementary data, formulating advice and papers/presentations giving further details of our blocked isocyanate chemistry can be supplied on request.
TRIXENE® AQUA BLOCKED ISOCYANATE DISPERSIONS DESIGNED FOR WATER-BASED 1K SYSTEMS

Our range of water-based blocked isocyanate dispersions can be used as crosslinkers and adhesion promoters for coatings and finishes on flexible and hard substrates. The Trixene® Aqua range offers a wide pH latitude including anionic and nonionic types, which are easy to formulate with good compatibility to a range of aqueous auxiliaries and other additives. These products can be used together with our water-based Witcobond® polyurethane dispersions (PUD) to formulate 1K coatings with improved chemical resistance, coating adhesion, and robustness.

Trixene® Aqua Blocked Isocyanates - water-based systems

<table>
<thead>
<tr>
<th>Trixene® Aqua Product</th>
<th>Particle Type</th>
<th>pH Range (as supplied)</th>
<th>Viscosity at 25°C (mPa-s)</th>
<th>Equiv. Wt. (as supplied)</th>
<th>Solids (%)</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>BI 120</td>
<td>Non Ionic</td>
<td>5 - 8</td>
<td>10 - 200</td>
<td>984</td>
<td>40</td>
<td>Textiles and fibers adhesion promoter</td>
</tr>
<tr>
<td>BI 200</td>
<td>Anionic</td>
<td>7 – 8</td>
<td>100</td>
<td>933</td>
<td>40</td>
<td>Textiles and general coatings</td>
</tr>
<tr>
<td>BI 201</td>
<td>Anionic</td>
<td>7 – 9</td>
<td>300</td>
<td>840</td>
<td>40</td>
<td>Textiles and general coatings</td>
</tr>
<tr>
<td>BI 202</td>
<td>Anionic</td>
<td>7 – 9</td>
<td>250</td>
<td>894</td>
<td>40</td>
<td>Glass, glass fibers, adhesion promotion</td>
</tr>
<tr>
<td>BI 220</td>
<td>Non Ionic</td>
<td>5 – 8</td>
<td>100</td>
<td>1000</td>
<td>40</td>
<td>Textiles, leather, glass, paper</td>
</tr>
<tr>
<td>BI 522</td>
<td>Non Ionic</td>
<td>5 - 8</td>
<td>10 - 200</td>
<td>1252</td>
<td>40</td>
<td>Coatings, improved chemical resistance</td>
</tr>
</tbody>
</table>

Data provided in the table above is characteristic of the product grade, and does not constitute a specification. Trixene® Aqua BI grades include a co-solvent to have better coalescence and compatibility in the coating formulation. Further information is given in technical and material safety data sheets for individual Trixene® BI products. Samples, supplementary data, formulating advice and papers/presentations giving further details of our blocked isocyanate chemistry can be supplied on request.

BLOCKED ISOCYANATE SYSTEMS FOR A RANGE OF COATINGS APPLICATIONS

LANXESS is at the forefront of blocked isocyanate technology and our products designed as solvent-borne, water-based and 100% solids meet the requirements of high performance coatings formulations in a wide range of application areas.

Advantages
- Broad portfolio covering all industry needs
- Easy and efficient processing for high performance coatings
- Tailored solutions for customer needs
- Easy formulation and no pot life limitations
- No handling of free isocyanates

Blocked Systems for diverse applications

- Plastic Coatings and Inks
- Textile Coatings
- Can and Coil Coatings
- Industrial Coatings
- Glass Coatings
- Transportation Coatings and Adhesives
DEDICATED R&D EFFORT FOCUSES ON THE HEALTH, SAFETY AND ENVIRONMENTAL IMPACT OF POLYURETHANE TECHNOLOGY

Our primary aim is to minimize hazards associated with free isocyanates, reduce VOC emissions and to lower the energy requirements of typical manufacturing processes that use our materials. In addition to standard Trixene® BI grades, we have a number of experimental products at different stages of evaluation.

LANXESS URETHANE SYSTEMS IS LEADING WITH TECHNOLOGY AND INNOVATION

We provide our customers with decades of urethane chemistry know-how, comprehensive application expertise, and deep manufacturing experience. LANXESS can provide custom formulations, contact us about your requirements.

In addition to Trixene® and Trixene® Aqua blocked isocyanates, LANXESS also offer blocked prepolymer systems, Witcobond® polyurethane dispersions and Adiprene® LF and Trixene® products which are innovative Low Free (LF) isocyanate prepolymer systems for a range of elastomers, coatings, adhesives and sealants.

Specialized provider of urethane systems, tailored to meet specific customer needs

Truly global and diverse coverage, offering quick and flexible responses to customer needs

Strong focus on sustainability with a broad portfolio providing performance, processing, and EH&S advantages
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