Substance for Success.

Technical Information B-TI 1

HORDAMER
Primary Polyethylene Dispersions
What Are HORDAMER Primary Dispersions?

Primary dispersions are produced by the high-pressure, aqueous polymerization of ethylene. An emulsifier stabilizes the final product.

Unlike secondary wax dispersion/emulsion, there is no need for post-oxidation of the PE wax to make it polar enough for it to be emulsified in water. The chain length of the wax becomes shorter as a result of the post-oxidation. This means that primary PE dispersions have a longer chain length and the molecular weight is approximately double the weight of a PE wax dispersion/emulsion. Even the molecule structure is highly branched in comparison to a PE wax. The melting point is much lower because of the different process used. The particle size distribution is similar to wax emulsions at approx. 200 nm (figure 5).

Manufacturing Process for Primary and Secondary Dispersions

Structure of HDPE Waxes

Structure of HORDAMER
HORDAMER Primary Polyethylene Dispersions at a Glance

<table>
<thead>
<tr>
<th></th>
<th>HORDAMER PE 02</th>
<th>HORDAMER PE 03</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Composition</strong></td>
<td>Primary dispersion of polyethylene with an anionic emulsifier</td>
<td>Primary dispersion of polyethylene with anionic and non-ionic emulsifiers</td>
</tr>
<tr>
<td><strong>Melting point in °C/°F</strong></td>
<td>95/203</td>
<td>95/203</td>
</tr>
<tr>
<td><strong>Non-volatile matter in %</strong></td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td><strong>pH value</strong></td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td><strong>Viscosity in mPa·s</strong></td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td><strong>Density at 20 °C in g/ml</strong></td>
<td>0.97</td>
<td>0.98</td>
</tr>
<tr>
<td><strong>Density in lbs/US gal at 68 °F</strong></td>
<td>8.1</td>
<td>8.2</td>
</tr>
<tr>
<td><strong>Molecular weight in g/mol</strong></td>
<td>16,000</td>
<td>16,000</td>
</tr>
<tr>
<td><strong>Compliant with 21 CFR § 175.300</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Where Is HORDAMER Used?

- In aluminum die cast applications as one component (often used in combination with secondary PE emulsions and/or silicones)
- In mold release formulations, it improves substrate wetting at high temperatures and also release properties
- As a lubricant at very high temperatures
- In hot melt adhesives and thermoplastic compounds as an anti-blocking additive in underwater pelletizing processes
- In water-borne adhesives to improve adhesion to thermoplastic substrates like polyethylene, polyester film and others
- In overprint varnishes to improve the rub resistance
- In floor care & polishes to increase scratch and abrasion resistance

What Are the Advantages of HORDAMER over Secondary PE Emulsions?

- Shows extremely good surface wetting at high temperature surfaces
- Will not yellow under UV exposure
- As a result of its polar functions in the molecule, the HORDAMER products can improve adhesion to non-polar substrates
- Shows high temperature stability
- Is FDA and BFR approved for direct food contact
- Anti-blocking effects on different surfaces like hot melts, PU, etc.
- Very high melt viscosity
**Die Cast Applications**

Usually, aqueous systems are not easily able to wet metal surfaces at a temperature range of 100–400 °C/212–752 °F because of the fact that a gas cushion (vapor layer) forms under the applied drop of liquid. This phenomenon is known as the Leidenfrost effect. The addition of HORDAMER ensures that perfect substrate wetting is achieved even at temperatures up to 400 °C/752 °F. The good wetting properties of HORDAMER are based on its unique structure and polar functionality. This explains why HORDAMER is successfully used as one component in mold release agents for metal die cast processes.

**The Leidenfrost Effect**

![Diagram of vapor bubbles and droplet floating](image)

<table>
<thead>
<tr>
<th>Nucleate boiling</th>
<th>Film boiling</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_{plate} &gt; T_{b, liquid}$</td>
<td>$T_{plate} \gg T_{b, liquid}$</td>
</tr>
</tbody>
</table>

$T_{plate} = \text{surface temperature of hot plate}$  
$T_{b, liquid} = \text{boiling point of liquid}$  

**Hot Melt Adhesives and Thermoplastic Granulates**

Soft thermoplastics such as TPE and TPU as well as hot melt, EVA-based adhesives are used in the form of granules. Under pressure and heat they exhibit caking/blocking effects especially when they are packed in bags, which makes handling and automatic filling difficult. By using HORDAMER during the underwater pelletizing, the PE film covers the granule’s particle surface and prevents blocking. There is no migration into the final parts.

**Heat and Pressure Cause Caking**

![Images of granules directly after extrusion and after being stored for 1hr at 70 °C/158 °F in an oven](image)

**Underwater Pelletizing – Schematic Diagram**

![Diagram of underwater pelletizing](image)

- Hot polymer
- Cooled-off polymer
- Wax emulsion and defoamer
- Cold polymer with wax emulsion and defoamer
**Water-borne Adhesives**

There is always a demand for raw materials that enhance the adhesion power of adhesives. In aqueous systems based on EVA or acrylics, HORDAMER improves adhesion to polypropylene (OPP and BOPP), and, to a certain degree, to polyethylene. Application fields for HORDAMER are film-laminated paper substrates, which are used for high-quality shopping bags, gift boxes and medicine packaging. Additionally, HORDAMER products provide better wetting of OPP substrates.

**Overprint Varnish**

HORDAMER improves scratch resistance, abrasion resistance and surface slip in water-borne printing inks and overprint varnishes as well as flexo inks. As a result of the special processing, the HORDAMER products have direct food contact approval and can even be used in inks for food packaging.

**Floor Polish**

In terms of surface protection, HORDAMER increases the scratch resistance on floorings without an increase in slip.
Products and Applications

BYK Additives

Product Range Additives:

• Additives to improve surface slip, leveling and substrate wetting
• Adhesion promoters
• Defoamers and air release agents
• Processing additives
• Rheological additives
• UV absorbers
• Viscosity depressants
• Wax additives
• Wetting and dispersing additives for pigments and extenders

BYK-Chemie GmbH
P.O. Box 10 02 45
46462 Wesel
Germany
Tel +49 281 670-0
Fax +49 281 65735
info@byk.com
www.byk.com/additives

Application Areas:

Coatings Industry
• Architectural Coatings
• Automotive Coatings
• Industrial Coatings
• Can Coatings
• Coil Coatings
• Wood & Furniture Coatings
• Powder Coatings
• Leather Finishes
• Protective & Marine Coatings

Plastics Industry
• Ambient Curing Systems
• PVC Plastisols
• SMC/BMC
• Thermoplastics

Printing Ink Industry
• Flexo Inks
• Gravure Inks
• Inkjet Inks
• Silk Screen Inks
• Offset Inks
• Overprint Varnishes

Paper Coatings
• Impregnation
• Coatings

Adhesives & Sealants

Construction Chemicals

Pigment Concentrates

Raw Materials for Manufacturing
Release Agents

BYK Instruments

BYK offers a complete line of testing instruments to meet your needs in many application areas:

• Gloss/Appearance
• Color

Portable or stationary laboratory equipment – including easy-to-use quality control software.

BYK instruments – the complete solution for the coatings and plastics industry.

BYK-Gardner GmbH
P.O. Box 970
82534 Geretsried
Germany
Tel +49 8171 3493-0
Fax +49 8171 3493-140
info.byk.gardner@altana.com
www.byk.com/instruments

ANTI-TERRA®, ATEPAS®, BYK®, BYK®-DYNWET®, BYK®-SILCLEAN®, BYKANOL®, BYKETOL®, BYKJET®, BYKOPLAST®, BYKUMEN®, DISPERBYK®, DISPERPLAST®, ISAROL®, LACTIMON®, NANOBYK®, SCONA®, SILBYK® and VISCOBYK® are registered trademarks of BYK-Chemie. AQUACER®, AQUAMAT®, AQUATIX®, CERACOL®, CERAFAX®, CERAFLOUR®, CERAMAT®, CERATIX®, HORDAMER® and MINERPOL® are registered trademarks of BYK-Cera.

This information is given to the best of our knowledge. Because of the multitude of formulations, production and application conditions, all the above-mentioned statements have to be adjusted to the circumstances of the processor. No liabilities, including those for patent rights, can be derived from this fact for individual cases.

This issue replaces all previous versions – Printed in Germany