Technical Information B-RI 14

PURE THIX

Non-ionic Polymer Thickeners
PURE THIX – Novel Non-ionic Associative Thickeners for Cosmetics and Personal Care

For water-borne systems different types of rheological additives are available:
- Inorganic thickeners: Smectite layered silicates OPTIGEL and LAPONITE (separate Technical Information available)
- Polysaccharides: Cellulose Gum, Xanthan Gum
- Synthetic organic polymers (non-associative): Acrylates
- Associative thickeners: PURE THIX

Nonionic Associative Thickeners PURE THIX

With the PURE THIX product line BYK Additives is offering a novel type of water phase thickeners. PURE THIX products are non-ionic associative thickeners based on hydrophobe modified PEG-180. The hydrophilic polyethylene glycol backbone gives the PURE THIX water solubility, while the hydrophobic modifications form an associative network with each other and with hydrophobic moieties and surfaces of other substances in the formulation, e. g. with pigments and surfactants. Associative thickeners have surfactant-like hydrophobes that “associate” with themselves and with solids dispersed in the medium. (see figure 1)

The PURE THIX technology enables variable rheological characteristics of products. Derived from type and amount of hydrophobes on the polymer backbone, rheology can be more Newtonian or more pseudoplastic.

The PURE THIX products are delivered as colourless 100% active flakes. They can be classified as follows by their INCI names and by their rheology:

<table>
<thead>
<tr>
<th>Product</th>
<th>INCI Name</th>
<th>Rheology</th>
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<tbody>
<tr>
<td>PURE THIX 1450</td>
<td>PEG-180/Laureth-50/TMMG Copolymer</td>
<td>Almost Newtonian</td>
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<tr>
<td>PURE THIX 1442</td>
<td>Polyether-1</td>
<td>Pseudoplastic</td>
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PURE THIX 1450 is thickening by association with other ingredients of the formulation, e. g. polymers and pigments. PURE THIX 1442 can actually gel water without any other hydrophobic substances.

Both products are easy to process without need of high shear. For PURE THIX 1442 heating to 60 °C with moderate stirring is recommended for quick solution. PURE THIX 1450 is easy soluble even in cold water.

PURE THIX is distinguished from other water phase thickeners by the following benefits:
- Crystal clear gels
- Salt tolerance
- Compatibility even with cationic surfactants
- No neutralisation
- pH independent viscosity in the application range pH 5.5 to 12
- Multifunctionality: Emulsifier, film former, humectant as additional effects
- "Associative" thickening with other formulation ingredients

Gellation of Water

Polyether-1 can actually gel water without any other substances in the formulation. Viscosity as a function of concentration when gelling water with PURE THIX 1442 is shown in figure 2.

Salt Tolerance

Ionic thickeners are strongly affected by salt content. The viscosity of systems with nonionic PURE THIX products is fairly constant at sodium chloride levels of 4% and higher. The salt tolerance of Polyether-1 in the range of 0 to 4% sodium chloride is shown in figure 3.

PEG-180/Laureth-50/TMMG Copolymer will have even higher salt tolerance in its areas of application.
Thickening of Cationic Surfactants

Many anionic thickeners are incompatible with cationic surfactants. Even at low concentrations of cationic surfactants mutual inactivation through salt formation may occur. With PURE THIX systems with cationic surfactants can be thickened as well. The graph in figure 4 demonstrates thickening of a 1% solution of stearyl dimethyl benzyl ammonium chloride (INCI name: Stearalkonium Chloride) with PURE THIX 1442. In a 3% emulsion of di(hydrogenated tallow alkyl) dimethyl ammonium chloride (INCI name: Quaternium-18) PURE THIX 1442 is thickening even more (see figure 5).

Associative Thickening with Zinc Oxide

Sunscreen products frequently contain micronised titanium dioxide or zinc oxide. The interaction of the hydrophobic moieties of PURE THIX with the surface of these pigments results in an associative thickening. The addition of 8% zinc oxide increases the viscosity of a 2% aqueous solution of PURE THIX 1442 by nearly 40% (see figure 6).

Thickening of a 3% Emulsion of Quaternium-18

Due to its unique benefits, PURE THIX is used in personal care and cosmetic applications as follows:

- **Skin care**: Emulsifying properties, elegant feel
- **Bath and shower gels**: Excellent skin feel, transparent thickening
- **Hair care**: Combability, use in conditioners with cationic surfactants, use in styling products
- **Sunscreen products**: Associative interaction with titanium dioxide or zinc oxide gives rise to thickening and dispersion of the actives
- **Decorative cosmetics**: Associative thickening with pigments

The novel non-ionic associative thickeners can further be used in cleaners:

- **Liquid cleaners for household and I&I applications**: Transparent thickening of neutral and alkaline cleaners
- **Disinfectants, fabric softeners, etc.**: Thickening and viscosity control of systems containing cationic surfactants and water as main solvent, at pH-values above 5.5.
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

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