



## Thick & thin of clays

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20 Microns' new grades of attapulgite and bentonite-based thickeners provide extra viscosity to water- and solvent-borne paints and coatings

Clay minerals, which are generally characterised by their small particle size, affinity for water, and response to chemical changes in their environment, are utilised for their gelling abilities and effect on viscosity in aqueous systems. Rendered organophilic by association with long-chain organic compounds, several of the clay minerals exhibit similar or even greater gelling abilities in various organic liquids.

Leading India-based industrial minerals company, 20 Microns Ltd, has developed two new grades – Hydrogel 70T and Rio-Bent – for use as speciality thickeners in water-borne and solvent-borne paints and coatings.

### Hydrogel properties

Hydrogel 70T is a chemically modified, hydrated magnesium alumino-silicate mineral – attapulgite, or  $Mg_5Si_8O_{20} \cdot 4H_2O$  – with a three-dimensional chain structure that gives it colloidal and absorptive properties. Typical chemical composition is shown in Table 1.

In a powdered form, Hydrogel comprises millions of colloidal particles, which are easily wet and dispersed in aqueous systems – causing thickening in the carrying medium.

20 Microns claims that its Hydrogel grades can provide thixotropic viscosity in liquid systems; a property of some non-Newtonian pseudo-plastic fluids. Thixotropy is developed by charge attraction on the surface of the particles, hydrogen bonding, and the entrapment of liquid within a chain-like network.

Essentially, these properties allow Hydrogel thickeners to form a gel when resting, but to thin the viscosity of the liquid when agitation or shear is applied. The longer agitation is applied the thinner the fluid's viscosity. Thus when shear is slowed, viscosity increases gradually.

### Rio-Bent

Rio-Bent, which is a rheological additive for solvent-borne systems, is an organic derivative of bentonite clay (*Figure 1*). It is an easily dispersible additive for systems containing primary aliphatic and other non-polar to medium-polar solvent-based paints and coatings. It can be added as a powder either before or after the pigment dispersion.

Rio-Bent is composed of agglomerates, which are stacks – or *books* – of bentonite platelets. Quaternary ammonium ions are bonded to the surface of the platelets. These ions render the platelets organophilic.

When Rio-Bent is added to an organic solvent and subjected to shear, the quaternary ammonium ions become dissolved. The force of dissolution keeps the clay platelets in suspension, dispersing the Rio-Bent and causing gelling.

### **Hydrogel applications**

- Produces stable, high viscosity suspensions at relatively low concentrations
- Used primarily as a gelling and thickening agent in water systems
- Creates stable suspensions of solids in liquids
- Provides a cost-effective alternative for partial replacement of organic thickeners
- In PVC, hiding increases with the level of Hydrogel present – owing to spacing of the titanium dioxide or primary pigment
- Good stain removal is obtained at all Hydrogel contents over a wide range of vehicles and PVCs
- Can be used without impairing the scrub-resistance of the paint
- Paints containing higher levels of Hydrogel show improved anti-sag properties; a function of paint's gel structure and its thixotropic characteristics
- Provides viscosity control, spread ability, and firm build on sharp edges
- Resistant to bacteria and chemicals, requiring less biocide than cellulose thickeners, owing to its inorganic composition

### **Rio-Bent applications**

- Easily dispersable
- Provides thixotropic properties to solvent-based systems, controls sag and pigment settling
- Chemical activator is not required

- Easily incorporated into formulations, requires no heating or special equipment
- Provides good levelling and coating thickness properties to the formulation
  
- Can be used as a replacement for conventional organo-clay additives

**Table 1: Hydrogel typical composition**

Mineral	%
SiO <sub>2</sub>	65.2
MgO	10.8
CaO	6.2
Fe <sub>2</sub> O <sub>3</sub>	4.5
Al <sub>2</sub> O <sub>3</sub>	11.9
P <sub>2</sub> O <sub>5</sub>	0.8
TiO <sub>2</sub>	0.5
Trace elements	0.1

Source: 20 Microns Ltd

**Figure 1: Formation of Rheo-Bentone**

Courtesy 20 Microns Ltd