ELEMENTIS

A global specialty chemicals company

Application Leaflet

BENTONE® DE

Easy dispersable hectorite clay

Key Benefits

- A refined hectorite clay thickener modified for easy dispersion
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Introduction

BENTONE® DE is an easy dispersible hectorite clay. Due to its fine particle size and the special beneficiation process the product can be easily dispersed and activated without the need for high shear forces. Another advantage is the possibility to make a high solid pregel. A pregel can be made at as high as 14% solids in water that is still pourable. This allows for easy handling and formulation flexibility during paint production.

It should be used in architectural coating systems (high PVC) for improved sag resistance and storage stability. Using BENTONE® DE can also improve the scrub resistance of the coating compared to other technologies.

Key benefits

- Reduced water demand of clay.
- Easy dispersion
- Brings superior suspension properties with heavy pigments.
- Gives consistent water release.
- Reinforces the film through its unique structuring mechanism.
- Helps color stability and scrub resistance.

Incorporation and levels of use

As a powder BENTONE® DE:

- Can be incorporated as easy stir-in
- Can be incorporated during the grind-phase or to the let-down (post-addition)

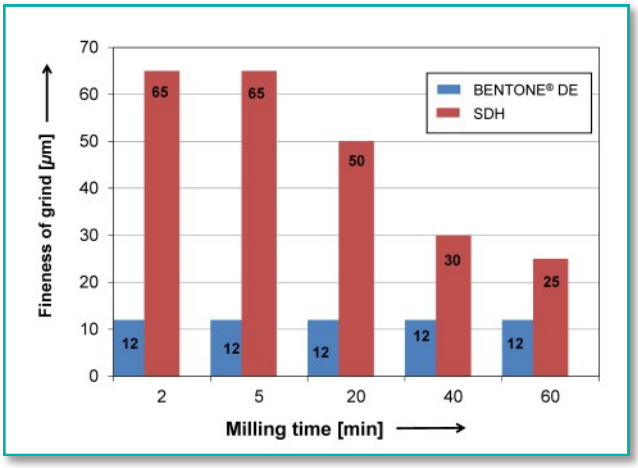
BENTONE® DE pregels:

- Can be made with up to 14% clay loading in water. These pregels are very stable and low in viscosity (pourable).
- Can be made without the need for high-shear forces.
- Due to their high solids content, can be added to formulations where water demand is critical.
- Diminish post-thickening.
- Post correction capability

Easy dispersion and activation

Standard hectorite grades need relatively high shear forces to be dispersed and activated properly. BENTONE® DE however, due to the special beneficiation process, can be dispersed and activated at lower shear or in a much shorter time period (see figure 1).

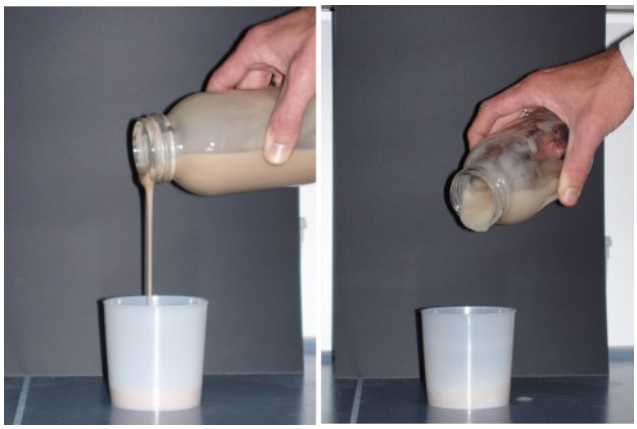
Figure 1



Apart from being easily dispersible, BENTONE® DE can also be prepared as a pregel with high solids. BENTONE® DE pregels can be made up to a concentration of 14% and are still of pourable viscosity.

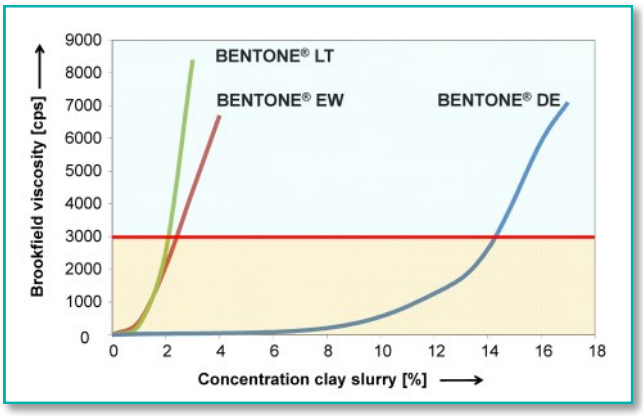
In figure 2 viscosity comparison with more conventional clay products is given.

Figure 2



The pourable viscosity allows for easy handling in production, whereas the high solids content of the pregel provides a larger formulation window. The product can be used in formulations where water demand is critical. This is due to the reduced amount of water added to the formulation when the pregel is used (figure 3).

Figure 3



The excellent dispersion and activation characteristics of the BENTONE® DE can be seen when the product is added to the paint formulation in powder form. With a normal hectorite grade the powder can only be added to the mill base. During milling you will have enough shear forces to disperse and activate the product properly. BENTONE® DE can be added both to the mill base and to the let down. (see table 1)

As with all clays the best properties will be reached if it is dispersed in water only. Therefore, despite the fact that the BENTONE® DE can be added as a powder, we recommend that a pregel (14%) is made prior to addition to the coatings formulation.

Table 1

	FOG	Brookfield viscosity [mPas]		KU viscosity	ICI viscosity
	[Hegman/µm]	10	100	[units]	[Poise]
Added to mill-base [5000 rpm]					
BENTONE® EW	7A/12	8120	1756	91	0.3
BENTONE® DE	7A/12	9240	1844	91	0.3
Added to let-down [1000 rpm]					
BENTONE® EW	1/90	4980	1284	84	0.3
BENTONE® DE	7A/12	7520	1592	89	0.3

In a latex formulation the activation speed and potential post-thickening was compared between the BENTONE® EW and BENTONE® DE.

Practical example

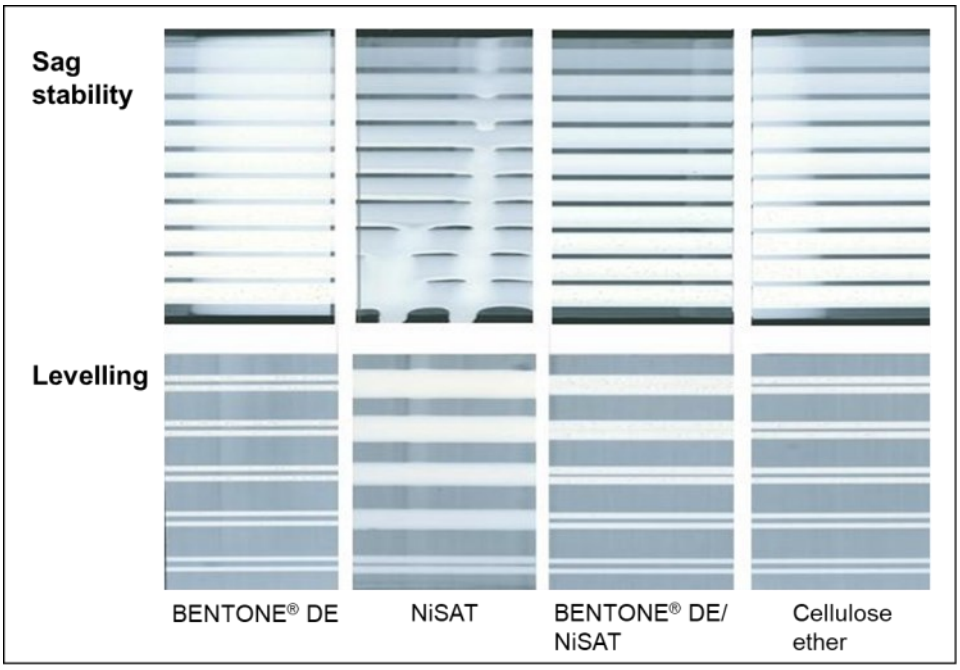
To formulate a paint with an excellent balance between sag resistance and levelling it is best to use a combination of hectorite and a polyurethane associative thickener.

In table 2 and figure 3 the performance of the separate thickeners is shown (BENTONE® DE, NiSAT, a combination of both and cellulose). It can be seen that the clay gives the best sag resistance whereas the PU gives very good levelling but poor sag. A combination of both gives a balanced performance.

Table 2

	Loading level [% active]	Viscosity [KU]	ICI Viscosity [P]	Brookfield viscosity, 10 rpm [mPa.s]	Sag 4 mm groove [mm]	Levelling [blade 419]
BENTONE® DE	0.76	96	0.6	12200	0	0
NiSAT	0.29	103	1.2	5220	130	7
BENTONE® DE/ NiSAT	0.30/0.18	102	1.0	8740	25	3
Cellulose	0.45	100	1.0	9020	16	0

Figure 4



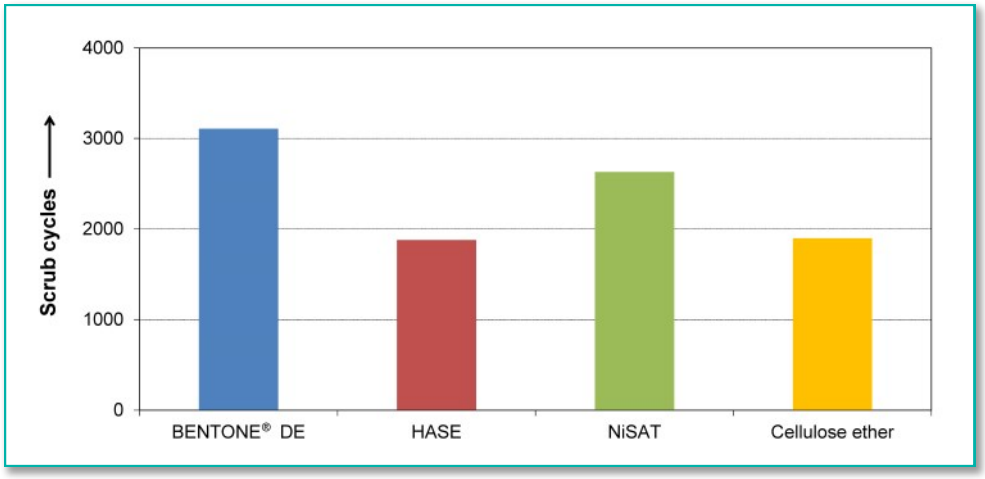
In table 2 and figure 4 it can be seen that cellulose also imparts good sag resistance to the formulation. However this sag resistance is not as good as for the hectorite.

A combination of a cellulose and a polyurethane thickener has a much lower level of scrub resistance than a BENTONE® DE/PU mix.

If a cellulose is combined with an (H)ASE both the scrub resistance and the water resistance will be decreased.

Scrub resistance data of BENTONE® DE in comparison to other classes of rheology modifiers in a paint formulation can be reviewed in figure 5.

Figure 5



It can be seen that the clay based BENTONE® DE provides significantly better scrub stability in comparison to cellulose ethers and acrylic/HASE based thickeners grades. The performance is even slightly better than with associative/NiSAT grades.

Practical example

- Reduced water demand of clay
  - Production vessels availability
  - Addition of water to formulation
- Ease dispersion and activation effort
  - Reduced dispersion forces/increased dispersibility
  - “Instant coffee” addition preferred
  - Diminish post-thickening
  - Improved pregel solids and stability
- Post correction capability
- Improved paint/coating performance

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