

Technical Information B-RI 10

# CLOISITE

Nanocomposite Additive for Halogen-free Flame Retardants

## Product Overview

### With CLOISITE, BYK Additives offers a new nanocomposite additive for polymer applications.

CLOISITE additives consist of organically modified layered magnesium aluminium silicate platelets. The platelets are surface modified with an organic chemistry to allow complete dispersion into the thermoplastic systems for which they were designed.

Contrary to conventional layered fillers like kaolin, talc or mica, the typical thickness of CLOISITE is 10 to 50 times smaller. The fully exfoliated silicate platelets that the CLOISITE additives are derived from are only 1 nanometer thick. This special structure of the layers results in an exceptionally high aspect ratio of more than 100. The high aspect ratio makes nanoclays superior to all other conventional layered fillers or short glass fibres.

The high aspect ratio is a reason for the extraordinary improvement in the properties of a wide variety of polymer materials. This improvement of the properties is achieved with a very low concentration of CLOISITE. The density of the polymers reinforced with nanocomposite additives is only slightly higher than the unfilled polymers.

This leads to a definite weight advantage especially in the area of automotive applications. CLOISITE covers a broad range of applications which helps to improve the mechanical and thermal properties. Also, the barrier characteristics of thermoplastics and thermosets are increased significantly:

- Improved heat distortion temperature
- Improved barrier characteristics
- Improved flame retardance performance

The first commercial success of the CLOISITE products started in halogen-free flame retardant cable compounds. BYK Additives offers three grades for flame retardant applications (see table below).

The development started with CLOISITE 5 and was followed by the finer milled grade CLOISITE 20. Both show very good properties in combination with ATH/MDH flame retardants.

With CLOISITE SE 3000, BYK Additives offers a new generation of modified CLOISITE products with better handling and processing properties.

## CLOISITE – The Product

Product	Application	Type	Description	Recommendations to achieve UL94 V-0
<b>CLOISITE 5</b> <b>CLOISITE 20</b>	PE/EVA grafted PP Cable formulation	Organic intercalated Nanoclay	Standard grades for inorganic flame retardant cable formulations with good pre-dispersibility	PE/EVA Sheathing 55 % ATH/MDH + 5 % CLOISITE
<b>CLOISITE SE 3000</b>	PE/EVA PP Cable formulation	Modified Nanoclay	Improved pre-dispersibility, handling and processing	PE/EVA Sheathing 55 % ATH/MDH + 5 % CLOISITE

figure 1

## How can CLOISITE Help to Improve Halogen-free Flame Retardants?



During the combustion of the cable, this three-dimensional network promotes a strong carbon crust, behaving like an insulation material. The dripping of the molten compound and the time until the burning stops is reduced. The time to ignition of the pyrolysis gases is increased. Therefore, the flame retardancy tests can be passed with a much lower quantity of hydroxides.

- Reduction of ATH/MDH from 65 % to 52,5–55,0 %
- Achieving of UL94 V-0 by adding 3–5 % CLOISITE
- Increased elongation at break
- Increased extrusion speed during cable production
- Higher productivity!

The diagram below shows the melt flow rate and the elongation at break of with CLOISITE improved compounds compared to a typical formulation. All three compounds are classified V-0 (3.2 mm/1/8") according to UL 94. The compounds with 3 % CLOISITE show up to a five-fold improvement in the melt flow rate and the elongation at break.

The industry is looking for more environmentally-friendly additives for plastic applications. Brominated flame retardants can be substituted with halogen-free systems like Al- and Mg-hydroxides. In order to pass the very strict burning tests, high amounts of these hydroxides are necessary. Such high additive loadings can have a detrimental effect on the mechanical or electrical properties of cable insulations. CLOISITE products offer a completely new solution to this problem.

With the addition of a small amount of CLOISITE, the inorganic filler loading can be reduced significantly. CLOISITE acts as a synergist in halogen-free flame retardant compounds.

The extremely fine particle size and the high aspect ratio of CLOISITE result in the formation of a three-dimensional network of inorganic silicate lamellas in the polymer (even at very low additive concentration).

### UL 94 Classification V0 – Constant Tensile Strength

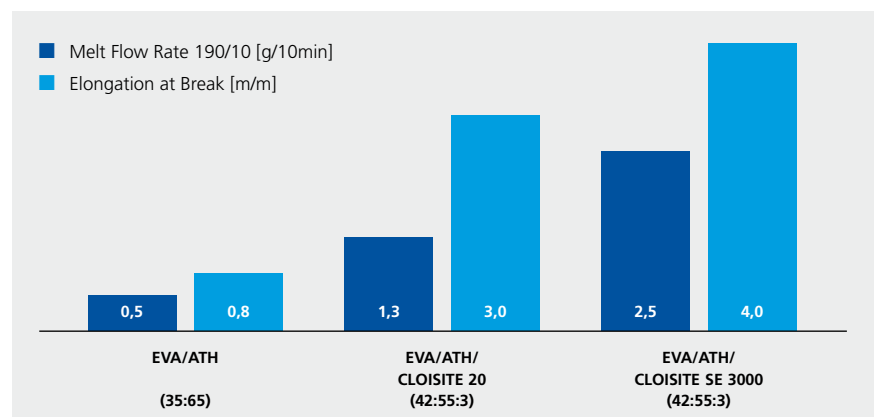


figure 2

## 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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#### 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 Plastics
- 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

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