

Lit. T-15 (10/04) Dispersion Guidelines for Nanomer® I.22E Nanoclay

General Information:

Nanomer® I.22E nanoclay is an onium ion surface modified montmorillonite mineral. It is designed to be easily dispersed into anhydride-cured epoxy resins to form nanocomposites. A number of properties are improved, including modulus, Tg and chemical resistance.

Anhydride-cured epoxy nanocomposites with 10 ~ 20 phr of Nanomer I.22E nanoclay exhibit significantly increased glass transition temperatures in the range of 10 to 20 °C (DMA method). Nanocomposites with higher loading (>20 phr) demonstrate further increased modulus over a broad temperature range but nearly identical glass transition temperatures.

Nanoclay Dispersion and Nanocomposite Preparation Methods:

Nanomer® I.22E nanoclay can be incorporated into epoxy resin systems using one of three methods:

- 1) Resin Dispersion. Mix the desired amount of nanoclay with the resin at 40 ~ 60 °C. Lower resin viscosity will promote dispersion. Anhydride curing agents and accelerators can then be added to the mixture. After thoroughly mixing and degassing, cure according to normal procedures.
- 2) Curing Agent Dispersion. I.22E can also be added to anhydride curing agents, provided at least 40 phr curing agent are employed. This method allows one to disperse at room temperature. Epoxy resin and curing accelerators, if desired, are then added to the mixture. Following thorough mixing and degassing, cure according to normal procedures.
- 3) Combination Dispersion. A final method is adding Nanomer I.22E nanoclay to a premix of resin, curing agents and accelerators. This is best done at room or slightly elevated temperature. After thorough mixing and degassing, the combination can be cured according to normal procedures.

Quick Dispersion Measurements:

There are two simple tests to determine when you have made a proper dispersion. The glass slide test is the fastest. Place a few drops of dispersion between two glass laboratory slides and press them firmly together. Hold the slides up to light and look through them. If no agglomerates are seen, the dispersion is complete.

The second test is sedimentation. Place the dispersion in a jar or beaker. Wait 10 minutes, then look at the bottom of the container. No sediment means the dispersion is complete.

In the rare case where agglomerates or sediment is observed, remix the dispersion and rerun the test.

Lit. T-15 (10/04) Dispersion Guidelines for Nanomer® I.22E Nanoclay

Important Points:

Although Nanomer® I.22E nanoclay is designed for easy dispersion, it is important to add it gradually while the mixer is running. For most equipment an addition rate of 20 pounds per minute will suffice.

All methods will introduce and entrap air bubbles. The level of air entrapment will vary with the viscosity of the system and type of mixer. Adequate degassing is needed in order to capture the enhanced properties with nanocomposite formation.

If you use method 1 expect a viscosity increase and adjust mixer speed accordingly. The viscosity may nearly double for some resins.

I.22E's chemistry will speed up the curing reaction. In many cases, no accelerators will be required. The speed of curing varies with the formulation. A bench trial should always be conducted when Nanomer nanoclay is incorporated into a resin for the first time.

For method 3, the shelf life of a typical resin mixture, e.g., Epon 828-ECA 100, is about 24~48 hr at room temperature. There is no effect on the shelf life of Nanomer® I.22E-resin mixtures prepared by methods 1 and 2.

Nanomer® I.22E nanoclay is not suitable for amine-cured systems. Nanocor makes additional grades for these systems

For more information on how Nanomer® nanoclay can work for you, contact Nanocor's Technical Service Group.

® Nanomer is a registered trademark of Nanocor, Inc.