Lit. T-10 (10/04) Epoxy Nanocomposites Using Nanomer® I.22E Nanoclay

General Information:

Nanomer® I.22E nanoclay is a modified montmorillonite mineral which is formulated for anhydride-cured epoxy resins. When properly dispersed, I.22E creates a near-molecule blend commonly known as a nanocomposite. This new type of composite enhances strength and thermal properties, especially glass transition temperature (Tg). Nanomer I.22E nanoclay is supplied as a white powder which disperses to particles so thin they are nearly transparent in the resin system. For more information about Nanomer structure and dispersion mechanism consult Tech Data G-100.

Loading Levels:

Unlike conventional mineral fillers, Nanomer nanoclays enhance performance at low loading, generally 10-25 phr. This unique feature allows for improved performance at minimal added weight.

Viscosity:

I.22E is preferred when mixing and/or curing must be done at lower viscosity. Table 1 gives typical viscosity data for low and high recommended loadings.

TABLE 1

Resin	Curing Agent	Nanoclay (phr)	RPM 10	RPM 30	RPM 50
		0	740 cps	740 cps	740 cps
EPON®828	ECA® 100	10	850 cps	830 cps	830 cps
		25	1250 cps	1200 cps	1150 cps

* Brookfield Model RV DV III, spindle # 3. All viscosities measured at 23^0C.

Suspension Stability:

Stability varies inversely with viscosity. I.22E forms a semi-stable system. Full stability will be maintained for 18-24 hours depending upon loading. Although the dispersion will “drop” over time, it will not hard-pack and can be reconstituted. If permanent stability is required I.28E should be used. However, I.28E will increase system viscosity and higher shear mixing equipment should be considered.

Strength Properties:

Epoxy nanocomposites exhibit improved mechanical properties due to reinforcing effects. Generally, the magnitude of improvement is larger in the region above the Tg. Figure 1 presents the DMA for neat epoxy and the corresponding nanocomposite at 25 phr loading.

Glass Transition:

I.22E creates a new, more interlinked structure in epoxy matrices. This is most apparent in the Tg. Increases of 10 - 20^0C are common. Although Tg increases with increased loading, most of the benefit is seen at the low end of the recommended range. A 10 phr loading usually produces 90% of the Tg improvement possible.

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Nanoclay Incorporation:

I.22E can be dispersed into the resin, curing agent or a combination of the two. Although it is easy to disperse, some simple guidelines must be followed. For detailed information consult Tech Date T-15.

Curing Accelerators:

I.22E accelerates curing to a moderate extent. Usually no additional curing accelerates are needed. I.22E is compatible with most common accelerators, should you feel one is desirable.

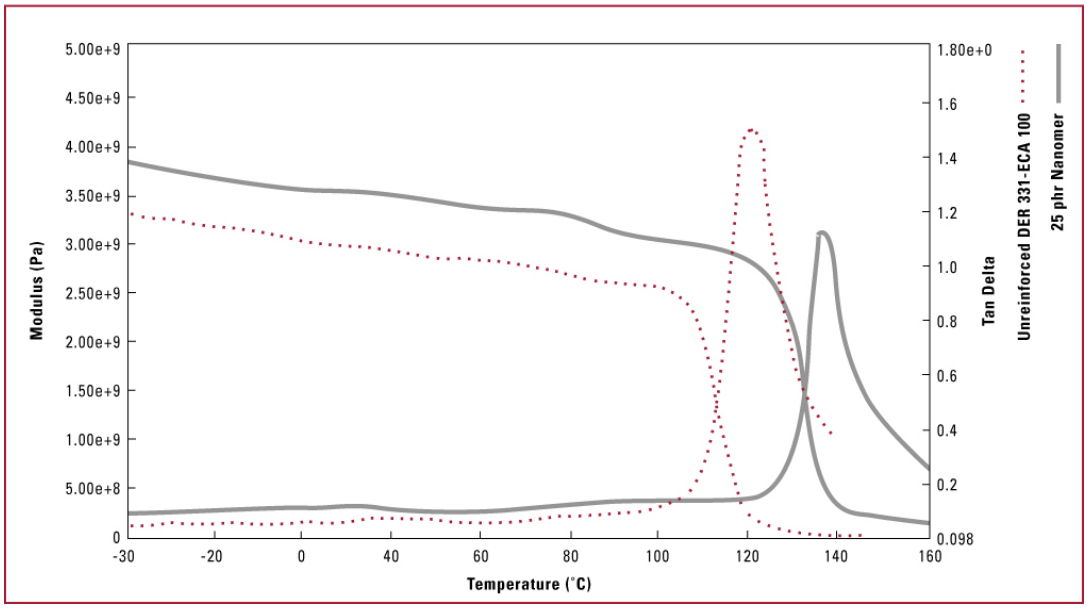
PHYSICAL PROPERTIES

Appearance	White Powder
Mean Dry Particle Size (microns)	8-10
+ 325 Mesh Residue (%)	0.1
Specific Gravity	1.9
Bulk Density (pounds/ft^3) (gm/cc)	25 0.41
Moisture (%)	3 max
Mineral Purity (% min)	98.5

Product Availability:

Nanomer I.22E nanoclay is available in 20 kg (44 lb.) polylined bags or fiber drums.

Figure 1 – Storage Modulus



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

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