

**Lit. N-603** (10/04) **Dispersion Guidelines for In-Reactor Nylon 6 Polymerization****General Information:**

Nanomer® nanoclays, such as grade I.24TL are formulated to disperse in caprolactam prior to Nylon 6 polymerization. It is easy to disperse Nanomer nanoclays, provided a few simple guidelines are followed.

Nanomer nanoclays “swell” in caprolactam. Swelling occurs because the monomer enters the gallery spaces between silicate layers, increasing the intragallery height (see Tech Data G-100). As the distance between silicate layers increases, their mutual attraction decreases. The level of shear required to disperse the silicate layers drops dramatically.

Monomer intrusion into the gallery is time dependent, and is aided by temperature. The two most important criteria are allowing sufficient swell time and maintaining an elevated temperature during swelling.

**Dispersion Procedure:**

- 1) Add dry Nanomer nanoclay to melted caprolactam under mild stirring conditions, sufficient to “wet out” the surface and create a homogeneous mixture.
- 2) Increase the temperature to 80°C for 2 hours.
- 3) Continuous stirring is not necessary but it is advisable if practical.
- 4) Following the swell period the mixture can be charged into the reactor.

**Polymerization Procedure:**

It is not possible to cover all variations of polymerization. A basic procedure is outlined below.

- 1) Heat the mixture to 260°C for 6 hours under agitation and nitrogen blanket.
- 2) The nanocomposite can be washed, pelletized and dried as normal.

**Control of Viscosity:**

Dispersed nanoclays have high surface area. The viscosity of the mixture will increase. Nanoclay loadings of 5% wt/wt can usually be achieved without exceeding most system capabilities. If viscosity creates a problem there are two options for controlling it:

- 1) Increased Agitation. Nanoclay/caprolactam mixtures are thixotropic. If shear is increased the viscosity will decrease.
- 2) Caprolactam/Water. Additional water can be added with no affect on dispersability. This option is contingent upon having downstream capability to remove excess water under controlled conditions.
- 3) Switch to I.24TL. This grade creates the lowest viscosity. (See Tech Data N-609)

**HMDA Addition to Nanomer I.24TL Nanoclay:**

Hexamethylene diamine can be added to nylon 6 nanocomposites to increase toughness. Generally HMDA is added at 6.3% wt/wt based on the Nanomer nanoclay. It is added when the 6-aminocaproic acid is introduced. No further changes need be made when using HMDA.

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

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