

## P-804 Nanomer® and nanoMax® Processing Guideline for Polyolefin Nanocomposites

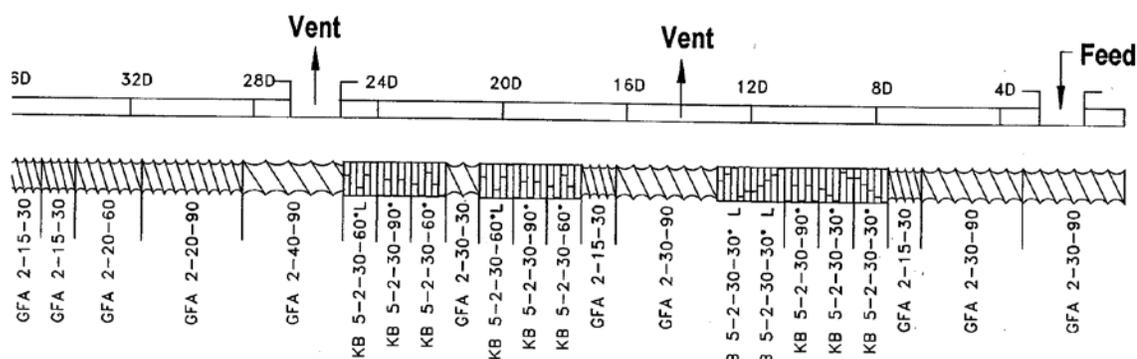
### General Description:

Nanomer® nanoclays are high purity, surface modified montmorillonite clay intended for use in a wide variety of plastics. When properly dispersed into polyolefins, Nanomer products create a nanocomposite with improved mechanical properties and flame resistance. Nanocor has commercial Nanomer nanoclay powder and nanoMax® nanoclay masterbatches available for polyolefin resin systems. Please refer to Nanocor Technical Datasheet P-801 for the choice of Nanomer products and P-802 for the choice of nanoMax products for polyolefins.

### Processing of Nanomer® nanoclay products

Nanomer can be blended into polyolefin with good dispersion and property improvements via melt compounding process. The loading level is commonly in the range of 4-6% for mechanical improvement and 1-4% for flame retardation. Usually a high shear mixing compounding equipment is recommended. For twin screw extruder, Nanocor recommend the following screw configuration and compounding parameters for optimal performance.

FIGURE 1



### SCREW CONFIGURATION

TABLE 1  
DETAILED CONFIGURATION FOR NANOMER DISPERSION

<u>ZONE</u>	<u>TEMPERATURE (°C)*</u>	<u>FUNCTION</u>
4D	Unheated	Conveying
8D	165	Conveying
12D	170	Melting / Dispersion
16D	170	Conveying
20D	170	Kneading/Dispersion
24D	170	Kneading/Dispersion
28D	170	Vacuum De volatilization (-26 in. Hg)
32D	170	Conveying
36D	170	Conveying and Building Pressure
Die	170	Strand Pelletizing

For optimized dispersion and property improvement, a compatibilizer such as maleic anhydride modified polyolefin is recommended. Please contact Nanocor Technical Service for the recommendation of a

compatibilizer for your particular resin system and applications. All compounding ingredients, such as resin, nanoclay, compatibilizer, and stabilizer can be added into the extruder main feeder. If large amount of filler, e.g., mineral flame retardant agent, needs to be added to the formulation, split feeding of the mineral FR agent will be required. For instance, 50% of the mineral FR agent can be fed through the main feed, and the rest can be fed from the side feeder.

The extruder temperature profile setting is for reference only. Customer should change the processing conditions when using different equipment or polyolefin resins.

### Processing of nanoMax™ products

nanoMax is a series of nanoclay-polyolefin masterbatch products. They are in pellet form, like regular plastic resins. Typically, nanoMax products contain 50% of Nanomer nanoclay. Compatibilizers are included in the nanoMax masterbatch products. The nanoMax is designed to be let down into neat polyolefins for improved mechanical and flame retardance, without the end users to handle powder form of nanoclay. In addition, these polyolefin nanocomposites have superior processability, chemical resistance, and aesthetics.

#### Injection molding process:

In most cases, nanoMax can be let down into neat resin in simple down stream processing equipments such as injection molder. nanoMax and other ingredients can be dry blended prior to molding. Since Nanomer has been pre-dispersed in nanoMax, good dispersion and property improvement can be achieved with ease. For processing, nanoMax should be added at the typical temperature setting you are currently using for polyolefins. In general, temperature over 460 F should be avoided to prevent thermal degradation of the products. Since nanoMax is designed for easy dispersion in polyolefins, moderate back pressure is recommended. In addition, nanoMax has been processed with low moisture content and drying is not necessary in most cases.

#### Compounding:

nanoMax can also be let down into polyolefins at a second compounding step, especially when other fillers and additives (such as FR additives, impact modifiers) are needed in the formulation. In this case, nanoMax can be added together with the resin from the main feeder of the process equipment. FR additives or impact modifiers can be feed at the main feeder or down stream feeder. Customer should pay attention to disperse other fillers and additives into the final formulation since nanoclay has been pre-dispersed. In addition, one should pay attention to the processing temperature and keep it lower than 460F (240C). Normal screw speed and feed rate can be used as you do with formulations without nanoMax.

Nanomer nanoclay and nanoclay masterbatch can be processed to make polyolefin nanocomposites by using conventional processing equipment. nanoMax masterbatch products offer much easier processing and handling. Customers can see the benefit of nanocomposite formulation after quick trials with nanoMax products. Customized nanoMax formulation, variations of based resin and nanoclay loading level, is available upon request.

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

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