MIRALON® Pulp Dispersion Guide

MIRALON® Pulp carbon nanotube material can be dispersed into many common solutions and systems to provide a variety of characteristics including electrical conductivity and ESD (electrostatic dissipative) properties, as well as mechanical properties.

Applications

May be used in epoxies, polymers, thermoplastics, adhesives, aqueous systems and other dispersion and solvent-based compositions.

Features

When added to dispersions, MIRALON® Pulp can impart strength, conductivity, electrostatic properties, reduced part shrinkage and other properties depending on the percentage by weight added to the dispersion and specific system. The material also inherently acts as a thixotropic agent and can increase viscosity, rendering additional additives, such as non-conductive fumed silica, no longer necessary in some formulations.

Techniques for best resulting dispersion

Order of addition: Whenever possible, MIRALON® Pulp carbon nanotube material should always be introduced into the dispersion first, or as early on as possible.

1. Weigh out MIRALON® pulp and directly add to desired base system.
2. Cursorily fold in pulp within base system if able; essentially “wet” pulp
3. Utilize ramped mixing if possible; start lower on rpm/speed/shear settings and rudimentarily incorporate pulp. Ramp up mixing to obtain high shear and optimal dispersion. Either by time increments, rpm settings, another parameter, or all the above, track progress using microscopy slides to monitor dispersion development and to help determine when a successful dispersion has been achieved. Microscopy slides will indicate whether a full dispersion has been achieved or if agglomerates and non-uniformity are present. If agglomerates are present or there are exclusion zones (pockets of unfilled resin/system), continued mixing is required.

   Note: while tracking microscopy, if you see a uniform dispersion and both minimum and smaller agglomerates, but you continue mixing, you may start to see the previously established network begin to degrade. Re-agglomeration may also occur. Both of these instances can be indicative that material is being over-dispersed or processed.

4. Once an adequate, and mostly uniform/stable dispersion has been achieved, add in remaining components and additives/fillers.

    a. If components are low viscosity, it will be better to add in incrementally with mixing in between to keep the viscosity and base dispersion from being dropped massively; this allows the base dispersion to remain intact.

    b. If components are thixotropic agents, add those in incrementally as well. Also explore potentially lowering the percentage by mass of thixotropic agents as MIRALON® Pulp characteristically imparts thixotropic properties/increases viscosity. In many cases, other thixotropic agents can be replaced, or at least decreased, with the use of MIRALON® Pulp carbon nanotube material, (ex: fumed silica), in the final target formulations.

    c. For best results, add in thixotropic agents and any other similar components last. This allows the ability to see the impact these additives have on the dispersion and gauge if any amounts of the other fillers normally added should be adjusted.

    d. Once all components have been added, perform final steps of dispersion with additional mixing. If the addition of any subsequent fillers has managed to disrupt the previously well dispersed MIRALON® Pulp, it may be necessary to implement high shear mixing again for the next stage of processing. Again, confirm uniformity and take microscopy slides, perform any rheology, and perform property testing.

5. Examples of types of dispersion equipment utilized to successfully disperse MIRALON® Pulp:

a. Lab scale/Bench Top: Flacktek. Model: DAC 150.1 FVZ-K; dual orbital mixer
b. Floor model: Flacktek. Model: DAC 1100.1 FVZ; dual orbital mixer
c. Torrey Hills, gap controlled 3RM (Three roll mill); gaps controlled manually (not most ideal)
d. Exakt 3RM, gap controlled, gaps controlled automatically through digital interface (preferred to above)
e. Ultra-Turrax, rotor-stator homogenizer, 3,000-25,000rpm
f. Ross Mixer/Double Planetary Mixer with Rectangular style blades
g. Trias 3RM from Buhler

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First Aid!
Refer to SDS as mentioned above.

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