Pros and Cons of Commonly Used Nanoparticle Dispersion Methods

1. Stirring
   - Affordable.
   - Tends to alter the nanoparticle structure.
   - There is likely to be an increase in temperature if the dispersion is sonicated for a long time.
   - Bath format is less effective than the probe format.
   - Unpredictable performance at the lower end of the market.

2. Homogenizing
   - Highly efficient.
   - Probe tip disintegration can contaminate samples.
   - Nanoparticle structure can be altered.
   - The temperature of the dispersion will increase even just for a few minutes.
   - Unpredictable performance at the lower end of the market.

3. Sonication
   - Uniform dispersion.
   - Will not change nanoparticle structure.
   - Cooling feature helps control the temperature of the dispersion.
   - Consistent and repeatable results. Can be used as an additional step to all other dispersion methods.
   - Does not work well with dispersions containing volatile solvents.

4. 3 Roll Milling
   - Affordable.
   - Rarely causes attrition or breaking of nanoparticles.
   - Inefficient.
   - Rarely disperses the particles evenly and has trouble with deglomeration.
   - Cannot prevent particles from aggregating or agglomerating.

High Pressure Homogenizer
- Highly efficient.
- Tends to alter the nanoparticle structure.
- Can cause increase in temperature of the dispersion.
- Expensive.

Low Shear

High Shear

Medium Shear

Magnetic Stirrer

Three Roll Mill

High Pressure Homogenizer

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