Why Nanomaterials?

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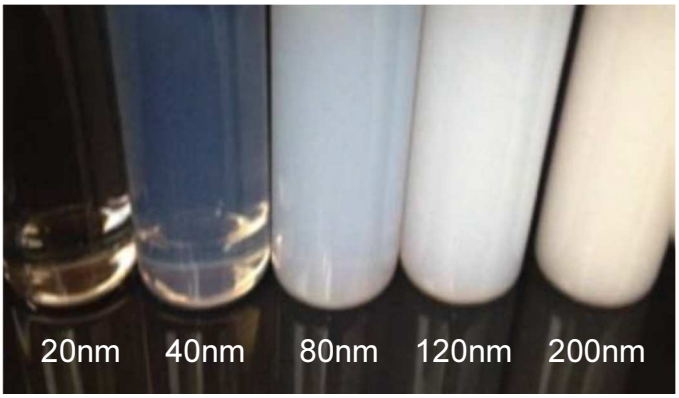
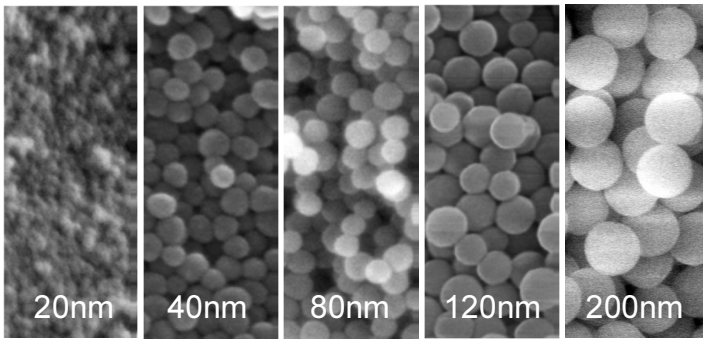
Nanomaterials are defined as materials of which a single unit is sized (in at least one dimension) between 1 and 1000 nanometers (10^{-9} meter). These materials have gained a tremendous amount of traction in the last two decades because of the widely differing properties that are obtainable compared to their bulk counterparts. Depending on the application, the particle size, distribution, morphology, and purity can have a significant influence on the physical, thermal, structural, and/or optical properties of the end product [1].

The photograph in Figure 1 illustrates the variation in optical properties for various silica nanoparticle dispersions. The solutions range from completely clear to totally opaque just by varying the average particle size from 20nm to 200nm.



GE&R silica nanoparticles dispersed in ethanol. Concentration of silica is the same in each sample.

With their exciting new properties nanomaterials are, ultimately, becoming door openers – enabling both new technologies and revolutionary improvements to current technologies. But, it turns out, engineering materials at this small scale is not easy.



SEM images of GE&R silica nanoparticles.

As one can imagine, tiny variations in processing parameters, incoming material variations, etc., which would typically be considered negligible for manufacturing bulk scale materials, when manufacturing nanomaterials, can have enormous effects on the resulting structure (size, morphology, etc.), and consequently alter the physical properties that are desired [2].

Manufacturing nanomaterials with consistent particle sizes, morphologies, and purities, in large scale quantities requires significantly more engineering controls, high end characterization equipment, and

procedures in place to ensure quality standards are met – thus achieving tight quality control can be difficult and expensive.

In order for these new technological “doors” to open, the price of high quality nanomaterials needs come down. GE&R has undertaken a significant development effort to create state-of-the-art processes that produce large quantities of high quality, high purity nanomaterials, at an economical price. We’ve done the characterization so you don’t have to.

Electron microscope images of GE&R’s high quality silica nanoparticles are shown on the previous page. GE&R silica is available for purchase in various quantities and particle sizes between 20-500nm at geandr.com. Bulk quantities are also available by contacting us at sales@geandr.com. Custom dispersions in a variety of solvents are available as well as custom sizes. Other metal oxide nanomaterial products are in development, as well as our exciting proprietary nano-sized contact release capsule technology.

REFERENCES

[1] E. Roduner, Chem. Soc. Rev., 583, 35, 2006.

[2] Nanotechnology Initiative
http://nano.gov/nanotech-101/special

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