546a Development of Supported Nanoparticulate Metal Complexes Using Compressed Carbon Dioxide as Antisolvent

Chad A. Johnson, Sarika Sharma, Bala Subramaniam, and A.S Borovik

The physical and chemical properties of nanomaterials are governed in part by size, shape and surface morphology. For example, metallic nanoclusters of sizes ranging from 1-10 nm have vastly different properties than their bulk forms. Few, if any, studies have reported about the characteristics of nanomaterials composed entirely of metal complexes because limited preparative methods have hindered production.

Nanoparticles of transition metal complexes were prepared using the PCA process and analyzed using a variety of techniques including scanning electron microscopy (SEM), transmission electron microscopy (TEM), powder diffraction, dynamic light scattering, and AerosizerTM dry powder analysis. Our findings indicate that the molecular structure of the precursor starting material influences the morphology of the final precipitate. For example, the planar precursors, such as [Ni(salen)] or [Co(salen)], yield primary particles with rod-like structures with submicon length scales and diameters of less than 100 nanometers. Deviations from planarity of the precursors produce substantial changes in particle structure, as illustrated by the 50 nm spherical particles prepared with [Ru(salen)(NO)(Cl)].

A major challenge in using the PCA process to produce a functional material is particle agglomeration due to the very fast precipitation kinetics. We attempt to overcome this problem by coating another material or support with the discrete nanoparticles. Initial work is focusing on coating beads with the metal complex followed by testing the ability of the coated beads to bind different permanent gases. These results will be presented and discussed.