Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Quantifying the Thermodynamic Interactions in Carborane Nanoparticle Solutions MARY MUTZ, University of Tennessee, ERIC EASTWOOD, Honeywell Kansas City Plant, MARK DADMUN, University of Tennessee and Oak Ridge National Laboratory — The dissolution of nanoparticles, particularly those containing boron, is an important area of interest for polymer nanocomposite formation and material development (1-2). In this work, the solubility of four boron cage molecules are quantified in toluene, THF, and methyl ethyl ketone with static light scattering, refractometry, UV-Vis spectroscopy, and physical observations. UV-Vis spectroscopy provides a method to determine the concentration and solubility limits of the solutions tested. Using light scattering, the second virial coefficient, A2, was determined and used to calculate χ, the solute-solvent interaction parameter. The Hildebrand solubility parameter, δ, was then extracted from this data using the Hildebrand-Scatchard solution theory (3-4). A list of potential good solvents based on the extracted δ value is provided for each nanoparticle. Of the systems tested, 1,3-di-o-carboranylpropane was shown to be a thermodynamically stable in toluene, with a χ less than 0.5, a solubility limit of 2.47 mg/mL, and all solutions remaining clear with no visible particle settling.

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Date submitted: 10 Nov 2011 Electronic form version 1.4