From: Dispersion Technology Inc. [andrei@dispersion.ccsend.com] on behalf of Dispersion Technology Inc. [adukhin@dispersion.com]
Sent: Friday, January 29, 2010 9:00 AM
To: adukhin@dispersion.com
Subject: Newsletter #21 from Dispersion Technology Inc.

Dispersion Technology Inc. Newsletter #21

Monitoring nano-particles in the presence of larger particles in liquids using Acoustics and TEM.

This study is result of collaboaration between **Columbia University** (P.Somasundaran and Xiaohua Fang) and Dispersion Technology Inc (A.Dukhin and P.Goetz). **www.dispersion.com**

Here is a short Abstract. Full text: J. Colloid and Interface Science, vol.342, #1, p.18-25, 2010.

Monitoring the presence of nano-particles in dispersions having a **broad particle size distributions** can be a problem for many measurement techniques because large particles or even aggregates of the smaller particles can mask the presence of the sought after nano-particles. The ability of many existing techniques to detect the nano-particles when present in broad polydisprse systems is largely unknown, yet it is critical for proper selection of the measuring technique for characterizing a particular nano-dispersion. Acoustic Spectroscopy is already a known and proven tool for studying nano-particles in systems with a narrow size distribution. The purpose of this paper is to evaluate the sensitivity of Acoustic Spectroscopy for determining the nano-particle content of very polydisperse systems.
We used eight different ZnO powders from different manufacturers to prepare 5%wt dispersions, each dispersed in water. The stability of the each dispersion was optimized by pH adjustment and addition of sodium hexametaphosphate as determined by maximizing the measured ζ-potential. According to the acoustic measurement, the median size of these different ZnO dispersions varied from 200 nm to 700 nm. Independent **TEM photographs in general confirmed the size variation between the samples**. Independent **DLS measurements failed** to provide particle size data correlating with TEM. The Acoustic measurements further showed that the each dispersion contained a different relative content in the nano-particle fraction. The precision with which the nano-particle fraction could be determined was better than 2% of the total solids loading for all samples. In order to verify consistency of this measurement we performed mixing study by adding dispersion with the largest nano-particles content to the dispersion with the smallest nano-particles content, in small increments. This test confirms that **Acoustics sensitivity threshold is about 2% of nano-particles** in the broad polydisperse dispersions of dense metal oxide particles.

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