Subject: MSD Colloquium, Thurs, July 6, 11am, 212, A-157
From: Janice Coble <coble@anl.gov>
Date: Wed, 21 Jun 2006 09:04:46 -0500
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SPEAKER: DR. OLGA SHENDEROVA
International Technology Center
Triangle Park, NC

TITLE: Detonation Nanodiamond: Processing and Applications

DATE: Thursday, July 6, 2006

TIME: 11:00 a.m.

PLACE: Building 212, Room A157

HOST: Dieter Gruen

Refreshments will be served at 10:45 a.m.

Abstract: World-wide interest has developed over the last years in nanostructured diamond materials and, particularly, in nanodiamonds of detonation origin invented in 60-s in the former USSR. Frequently, new researchers entering the field do not realize initially that there is a wide variety of detonation nanodiamond (DND) produced by different vendors using different synthesis and purification techniques. The different techniques determine the surface chemistry, agglomerate sizes, dispersivity and sedimentation stability in different types of solvents.
From a practical point of view, in order to readily utilize DND particulate in many nanotechnology applications it is necessary to modify the surface chemistry and to separate the particles into a more narrow range of particles (fractionalization). In this study we will report on 'dry' methods of modification resulting in an increase of the content of polar or non-polar surface groups. Using high temperature treatment of DND followed by dispersion in water and other liquids using high power sonicator and multi-step ultracentrifugation, stable hydrosols were formed from the smallest particle-size fraction (down to 20nm particles). We will also demonstrate that an atmospheric pressure dielectric barrier glow discharge system is a powerful tool for the surface functionalization of nanodiamond particulate. DND functionalization was performed using plasma discharges generated with fluorine containing gases as well as nitrogen and air.
Several examples of applications of the modified/fractionalized DND and onion-like carbon that are under development at ITC and in collaboration with other centers will be discussed: (i) polymer composites with improved thermal degradation/EMI shielding properties, (ii) metal coatings with improved microhardness and wearability, (iii) cooling nanofluids, (iv) DND as carriers of biomolecules for ballistic delivery to cells and tissues and other biomedical applications including animal studies.

Acknowledgment: I acknowledge the colleagues and collaborators contributed to the reported studies: Varvara Grichko, Mark Ray, Talmage Tyler, Garry Cunninghame, Scott Walls, Suzanne Hens, Victor Grishko and Gary McGuire of ITC, Igor Petrov of New Technologies, Russia, Vladimir Kuznetsov of Boreskov Institute of Catalysis, Russia, Alexey Puzyr of Krasnoyark Institute of Biophysics, Russia.