Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Homogeneous Nanodiamonds Are Different in Reality CHI-CHIN WU, JENNIFER GOTTFRIED, ROSE PESCE-RODRIGUEZ, US Army Rsch Lab - Aberdeen, ADVANCED ENERGETIC MATERIALS TEAM — Commercial detonation nanodiamonds (ND) have been investigated for many applications. They consist of carbon nanoparticles with diamond cores surrounded by onion-like graphitic shells. Unfortunately, variations in the purity and carbon structure between commercial ND samples due to variations in synthesis and purification conditions is an ongoing issue, since these differences can affect the resulting application-dependent ND behavior. Via characterization with transmission electron microscopy, this work investigates the structural and chemical differences among nominally homologous commercial detonation ND sold by a single vendor under the same item number. Significant discrepancies in the carbon structure and crystallinity between different batches with similar sizes and shapes were identified. The ND containing more non-carbon entities as impurities and oxygen-containing surface functional groups were found to possess thicker graphitic shells surrounding an unstable diamond core which quickly transforms to graphite under electron beam irradiation. However, the structure of ND with higher purities and thin onion shells remain unchanged over extended exposure to electron beams. This study demonstrates the structural and chemical differences between nominally identical commercial detonation ND samples and reveals their influence on the decomposition behavior of the particles.

Chi-Chin Wu
US Army Rsch Lab - Aberdeen

Date submitted: 21 Nov 2016 Electronic form version 1.4