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Characterization of Detonation Soot Produced During Steady and Overdriven Conditions for Three High Explosive Formulations DAVID PODLESAK, RONALD AMATO, DANA DATTELBAUM, MILLICENT FIRESTONE, RICHARD GUSTAVSEN, RACHEL HUBER, BRYAN RINGSTRAND, Los Alamos National Laboratory — The detonation of high explosives (HE) produces a dense fluid of molecular gases and solid carbon. The solid detonation carbon contains various carbon allotropes such as detonation nanodiamonds, "onion-like" carbon, graphite and amorphous carbon, with the formation of the different forms dependent upon pressure, temperature and the environmental conditions of the detonation. We have collected solid carbon residues from controlled detonations of three HE formulations (Composition B-3, PBX 9501, and PBX 9502). Soot was collected from experiments designed to produce both steady and overdriven conditions, and from detonations in both an ambient (air) atmosphere and in an inert Ar atmosphere. Structural studies to glean the features of the solid carbon products have been performed using scanning electron microscopy (SEM), transmission electron microscopy (TEM), powder X-ray diffraction (XRD), Raman spectroscopy, small-angle X-ray scattering (SAXS), and X-Ray Pair Distribution Function measurements (PDF). Bulk soot was also analyzed for elemental and isotopic compositions. We will discuss differences in the structure and composition of the detonation carbon as a function of formulation, detonation conditions, and the surrounding atmosphere.

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