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Particle evolution of Composition B-3 studied by time-resolved small angle x-ray scattering R HUBER, D PODLESAK, D DATTELBAUM, M FIRESTONE, R GUSTAVSEN, B JENSEN, B RINGSTRAND, E WATKINS, Los Alamos National Laboratory, M BAGGE-HANSEN, R HODGIN, L LAUDERBACH, T WILLEY, T VAN BUUREN, Lawrence Livermore National Laboratory, T GRABER, P RIGG, N SINCLAIR, Washington State University, S SEIFERT, Argonne National Laboratory — Accessing various pressures and temperatures of the carbon phase diagram through high explosive (HE) detonations, as a means of synthesis, provides an exciting opportunity to study new carbon allotropes. Carbon allotropes in HE detonations are thought to form through collision of free carbon within the detonation cloud; however direct confirmation of real-time product formation is limited due to experimental restraints. Time-resolved small angle x-ray scattering (TRSAXS) of in-line detonations provides information about particle formation behind the detonation front on the 100's of nanoseconds timescale. The only set-up of its kind in the United States is at Argonne National Laboratory at the Advanced Photon Source in the Dynamic Compression Sector (DCS). Through empirical and analytical analysis of the TRSAXS data, parameters such as particle size and morphology can be deduced with respect to time. In the case of Composition B-3 (40% TNT/60% RDX) particle formation morphs from spherical core-shell structure to an elongated structure at long times (˜2 us) under vacuum. To complete the timeline of carbon formation, the post detonation soot is also analyzed to confirm this elongated structure as the majority carbon product. LA-UR-16-28691

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