

Thursday Evening Poster Sessions, October 24, 2019

**Frontiers of New Light Sources Applied to Materials,
Interfaces, and Processing Focus Topic**

Room Union Station B - Session LS-ThP

**Frontiers of New Light Sources Applied to Materials,
Interfaces, and Processing Poster Session**

LS-ThP2 Observing Formation of Detonation Nanodiamond at Sub-Microsecond Timescales at the Advanced Photon Source, *Trevor Willey, J.A. Hammons, M. Bagge-Hansen, M.H. Nielsen, L.M. Lauderbach, R. Hodgkin, W. Shaw, W. Bassett, E. Stavrou, S. Bastea, L. Fried, L. Leininger,* Lawrence Livermore National Laboratory

Over the past few years, we have developed a capability to perform small-angle x-ray scattering (SAXS) and wide-angle x-ray scattering (WAXS) during high explosive detonation. We can acquire a SAXS or WAXS pattern from individual 80 ps x-ray pulses, which at the APS in 24-bunch mode, arrive every 153.4 ns. We can acquire up to eight frames, from sequential pulses, per event. Various morphologies of carbon condensates appear during detonation, dependent upon the pressure and temperature attained, and liquid, diamond, and graphitic phases can be inferred from the SAXS and WAXS. Transmission electron microscopy of recovered nanoparticles confirms these phases. Nanoparticles, including detonation nanodiamond, form over a few hundred nanoseconds. Here, we present an overview of the capability and a few select results.

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