

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Non-Thermal Liquid Formation Dynamics Studied with Ultrafast Diffuse X-Ray Scattering KELLY GAFFNEY, PULSE Center, SLAC, CHRISTIAN BLOME, DESY, SIMON ENGEMANN, PULSE Center, SLAC, DAVID FRITZ, LUSI, SLAC, PATRICK HILLYARD, Stanford University, Department of Chemistry, JORGEN LARSSON, Lund University, AARON LINDENBERG, PULSE Center, SLAC, MATTHIEU NICOUL, University Duisburg-Essen, DAVID REIS, FOCUS Center, University of Michigan, KLAUS SOKOLOWSKI-TINTEN, University of Duisburg-Essen, JERRY HASTINGS, LUSI, SLAC, THE SUB-PICOSECOND PULSE SOURCE COLLABORATION — The ultrafast melting dynamics of a laser excited semiconductor crystal have been studied with femtosecond x-ray scattering. We have used diffuse x-ray scattering to determine that a liquid structure appears within 2 ps of laser excitation. This structure preserves the density of the crystal, and can be well fit with a hard sphere structure factor, unlike equilibrium liquid InSb. At a delay time of 100 ps, an under-dense liquid structure forms with large amplitude scattering at intermediate momentum transfer. A concurrent rise in small angle scattering intensity suggests that voids form in this under-dense liquid. Cooling and contraction leads to the formation of a dense liquid structure on the ns time scale distinct from that of the equilibrium liquid InSb. The equilibrium liquid structure does not appear until delay times of 20 ns and longer.

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Date submitted: 20 Nov 2006

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