

Abstract Submitted
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Ultrafast XRD of Heterogeneous Solid Hydrogen at LCLS¹

ABRAHAM LEVITAN, Olin College of Engineering, LUKE FLETCHER, SLAC National Accelerator Laboratory, MICHAEL MACDONALD, University of Michigan, SIEGFRIED GLENZER, SLAC National Accelerator Laboratory — The high intensity and short pulse duration of the Linac Coherent Light Source (LCLS) at SLAC allows for single shot x-ray scattering studies from a jet of frozen hydrogen. The high repetition rate of LCLS allows us to build a detailed understanding of the cold structure of this jet. This provides a strong foundation for analysis of time resolved scattering data from the laser heated hydrogen jet. Angularly resolved x-ray diffraction at 5.5 keV is used to establish the structure of the cold 5 μm diameter solid hydrogen jet. The jet was composed of approximately 65 % \pm 5 % HCP and 35 % \pm 5 % FCC by volume with an average crystallite size on the order of hundreds of nanometers. Broadening in the angularly resolved spectrum provided strong evidence for anisotropic strain up to approximately 3 % in the HCP lattice. Finally, we found no evidence for orientational ordering of the crystal domains.

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