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Diffuse scattering from shock compressed single crystal copper by use of nanosecond x-ray Laue diffraction MATTHEW SUGGIT, ANDREW HIGGINBOTHAM, GABRIELE MOGNI, GILES KIMMINAU, JUSTIN WARK, University of Oxford, UK, ANDREW COMLEY, NIGEL PARK, AWE, Aldermaston, UK, JAMES HAWRELIAK, BRUCE REMINGTON, LLNL — The mechanism by which plastic relaxation occurs in the shock environment is not fully understood. There is evidence that the generation and flow of dislocations must mediate the ultra-high strain rates involved, and applying Orowan's equation suggests that the dislocation densities may be up t of order $10^{13}\mathrm{cm}^{-2}$, a value which has not been observed in recovery experiments. We report on recent x-ray diffraction experiments using a quasi-white-light source to probe shock compressed single crystal copper, which were performed using the JANUS laser at LLNL. The x-ray source is provided by a mixed metal backlighter foil, comprised of mid-Z elements, which produces a broad spectrum of x-rays of energy ranging from 3 to 10 keV.[1] The single-shot diffraction patterns for 10μm thick single crystal Cu were recorded as well as free surface VISAR measurements. In the resulting diffraction patterns, we observed diffuse scattering around multiple diffraction peaks. We discuss the possible plasticity mechanisms responsible.

[1]Suggit et al. Rev. Sci. Instrum. **81**, 083902 (2010)

Justin Wark
University of Oxford

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