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In-situ probing of lattice response in shock compressed materials using x-ray diffraction[1]

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Diagnostics which can probe the lattice response during shock compression offer insight into many key features of the physical phenomena which govern material response. An in-depth analysis of diffraction images of the alpha to epsilon transition in shock compressed single crystal iron offers insight into the transition mechanism of the lattice due to compression along the 100 principal axes. These single crystal diffraction techniques integrate well with molecular dynamics simulations, and have been shown to offer insight into the atomistics of the shock process. The recent development of polycrystalline diffraction techniques offers similar levels of insight into materials which are more complicated by their nature of having grains of multiple orientations, but are more representative of commonly used materials. This work was conducted under the auspices of the U.S. DOE by the UC LLNL and LANL under Contract No. W-7405-Eng-48. Additional support was provided by LDRD program Project No. 06-SI-004 at LLNL.

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