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In situ X-ray diffraction study of high-pressure phase transition in zinc oxide under shock loading SALLY JUNE TRACY, Carnegie Institution for Science, STEFAN TURNEAURE, Washinton State University, THOMAS DUFFY, Princeton University — The wurtzite-to-rocksalt phase transformation in zinc oxide (ZnO) was investigated under shock loading using pulsed synchrotron x-ray diffraction at the Dynamic Compression Sector at the Advanced Photon Source. At ambient conditions, ZnO crystallizes in a tetrahedrally coordinated wurtzite structure. Static experiments have established a phase change to a rocksalt structure at 9 GPa. Continuum gas-gun studies identify a similar phase transition under shock loading between 12-15 GPa. This type of pressure-induced transition to a rocksalt structure is common to many semiconducting-wurtzite and zincblende compounds. New capabilities for time-resolved x-ray diffraction present unique opportunities to identify phases forming along the Hugoniot as well as to constrain orientation relations between parent and daughter phases. Various orientations of single-crystal ZnO as well sintered polycrystalline ZnO were shock compressed to 20 GPa using a two-stage light gas gun. In-situ x-ray diffraction data collected in the shock-compressed state confirm the high-pressure phase observed on the Hugoniot corresponds to the rocksalt structure. Furthermore, an analysis of the pre-impact Laue pattern along with the textured diffraction from the transformed material can place new constraints on the orientation relations between the starting wurtzite and high-pressure rocksalt phases.

Sally Tracy
Carnegie Institution for Science

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