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Structural Stability of Zirconium at High P-T Conditions investigated by combined x-ray diffraction and ultrasonic measurements MATTHEW JACOBSEN, NENAD VELISAVLJEVIC, Los Alamos National Laboratory, YOSHIO KONO, CHANGYONG PARK, HPCAT, Carnegie Institute of Washington — Advances in high pressure experimental techniques are continuously providing opportunities to study and gain deeper insight into behavior of materials subjected to extreme P—T conditions. Over the last 60 years, many of the emerging high pressure experimental techniques are coupled with xray probes, and in particular with large scale x-ray sources at multiuser national facilities. One of the newer capabilities at beamline 16BM—B of High Pressure Collaborative Access Team (HPCAT) at Advanced Photon Source allows for simultaneous xray diffraction, xray radiography, and ultrasonic velocity using a large volume Paris-Edinburgh press. Structural stability of group IV—B (Ti, Zr, and Hf) transition metals at high P—T has been widely investigated. As a result of these studies, it is known that Zr, in particular, undergoes a structural phase change from the ductile α (HCP) phase to the more brittle ω (open hexagonal) phase. Using combined ultrasonic and x—ray measurements, we are able to better define onset of structural transition in Zr. In addition, these better establish correlation between elastic moduli and resulting structural stability. Some aspects of the HPCAT capability will be discussed, as well as measurements recently performed on zirconium (Zr).

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