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Time-Resolved X-ray Diffraction and Electrical Resistance Measurements of Structural Phase Transitions in Zirconium NENAD VELISAVLJEVIC, Los Alamos National Laboratory, STANISLAV SINOGEIKIN, HPCAT, Geophysical Laboratory Carnegie Institution of Washington, RAMON SAAVEDRA, RAJA CHELLAPPA, Los Alamos National Laboratory, ANDRE ROTHKIRCH, Deutsches Elektronen-Synchrotron (DESY), DANA DATTELBAUM, Los Alamos National Laboratory, ZUZANA KONOPKOVA, HANNS-PETER LIERMANN, Deutsches Elektronen-Synchrotron (DESY), MATTHEW BISHOP, TSOI GEORGIY, YOGESH VOHRA, Dept. of Physics, University of Alabama at Birmingham — We have designed a portable pressure controller module to tune compression rates and maximum pressures attainable in a standard gas-membrane diamond anvil cell (DAC). During preliminary experiments, performed on zirconium (Zr) metal sample, pressure jumps of 80 GPa or higher were systematically obtained in less than 0.2s (400GPa/s). In-situ x-ray diffraction and electrical resistance measurements were performed simultaneously during this rapid pressure increase to provide the first time resolved data on $\alpha \rightarrow \omega \rightarrow \beta$ structural evolution in Zr at high pressures. Direct control of compression rates and peak pressures, which can be held for prolonged time, allows for investigation of structural evolution and kinetics of structural phase transitions of materials under previously unexplored compression rate-pressure conditions that bridge traditional static and shock/dynamic experimental platforms.

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