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Fast Compression and Decompression capabilities at HPCAT STANISLAV SINOGEIKIN, JESSE SMITH, CHUANLONG LIN, ERIC ROD, GUOYIN SHEN, HPCAT, Geophysical Laboratory, Carnegie Institution of Washington, HPCAT TEAM — Materials behavior and phase transformation pathways are strongly influenced by the time dependence of the driving mechanism (compression, thermal transfer, strain, irradiation, etc). While shock compression and static compression are well established techniques available for a long time, the techniques filling the compression rate gap and studying materials behavior as a function of compression rates at intermediate rates remain scarce. Recent advances in synchrotron sources, x-ray optics, fast area detectors, and sample environment control have enabled many time-resolved experimental techniques for studying materials at extreme pressure and temperature conditions. The High Pressure Collaborative Access Team (HPCAT) at the Advanced Photon Source has made a sustained effort to develop and assemble a powerful collection of high-pressure apparatus for time-resolved research and developing techniques for collecting high-quality time-resolved x-ray scattering data at compression rates intermediate between static and shock compression experiments. In this talk we will outline recently developed capabilities at HPCAT for synthesis of metastable and amorphous materials and studying properties (EOS, lattice relaxation, etc.) and phase transition mechanisms of materials using fast unidirectional and cyclic compression-decompression with variable strain rates up to extreme compression of tens of TPa per second.

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