Crystallography at 100 GPa and above

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Modern science and technology rely on the fundamental knowledge of matter that is provided by crystallographic studies. The most reliable information about crystal structures and their response to changes in pressure and temperature is obtained from single crystal diffraction experiments. Advantages in diamond anvil cell techniques (DACs) and modern X-ray sources have increased the accessible pressure range for structural research up to several dozens gigapascals. We have develop a methodology to perform single crystal X-ray diffraction experiments in double-side laser-heated DACs and demonstrate that solution of crystals structure refinements and accurate measurements of the thermal equation of state of metals, oxides, silicates from single crystal intensity data are possible in a megabar pressure range at temperatures of thousands degrees. Particular attention we paid on in situ study of geomaterials at extreme conditions.