

New insights into the compression behavior of polycrystalline materials using energy-dispersive x-ray diffraction

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The stress conditions inside pressure devices are a function of the macroscopic stress field of the device, the nature of the pressure transmitting medium, and the microscopic stress field set up by the sample itself. The investigation of properties of matter under pressure requires a hydrostatic sample environment. Non-hydrostatic conditions manifest themselves for example as deviations from purely elastic compression in x-ray diffraction studies of single crystals or polycrystalline materials. However, a detailed look at these effects is still lacking.

The compression behavior of polycrystalline materials in different pressure-transmitting media in the diamond anvil cell and the MAX80 has been studied using energy-dispersive x-ray diffraction. New insights have been made possible by extensive background suppression and characterization of the resolution of the experimental setup. The implications for some high pressure techniques will be discussed.