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Anisotropic elasticity of jarosite: A high-*P* synchrotron XRD study

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Abstract

The elastic properties of jarosite were investigated using synchrotron X-ray diffraction coupled with a multi-anvil apparatus at pressures up to 8.1 GPa. With increasing pressure, the *c* dimension contracts much more rapidly than *a*, resulting in a large anisotropy in compression. This behavior is consistent with the layered nature of the jarosite structure, in which the (001) $[Fe(O,OH)_6]/[SO_4]$ sheets are held together via relatively weak K-O and hydrogen bonds. Fitting of the measured unit-cell parameters to the second-order Birch-Murnaghan equation of state yielded a bulk modulus of 55.7 ± 1.4 GPa and zero-pressure linear compressibilities of 3.2×10^{-3} GPa^{-1} for the *a* axis and 13.6×10^{-3} GPa^{-1} for the *c* axis. These parameters represent the first experimental determination of the elastic properties of jarosite.

Keywords: Jarosite, elastic properties, compressibility, bulk modulus, equation of state, synchrotron X-ray diffraction