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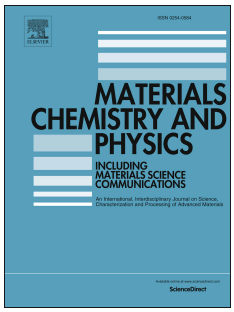

Anomalous lattice compressibility of hexagonal Eu_2O_3

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Anomalous lattice compressibility of hexagonal Eu_2O_3

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Abstract

Monoclinic Eu_2O_3 was investigated in a Mao-Bell type diamond anvil cell using angle dispersive x-ray diffraction up to a pressure of 26 GPa. Pressure induced structural phase transition from monoclinic to hexagonal phase was observed at 4.3 GPa with 2% volume collapse. Birch – Murnaghan equation of state fit to the pressure volume data yielded a bulk modulus of 159(9) GPa and 165(6) GPa for the monoclinic and hexagonal phases respectively. Equation of state fitting to the structural parameters yielded an axial compressibility of $\beta_a > \beta_c > \beta_b$ for the parent monoclinic phase, showing the least compressibility along *b* axis. Contrary to the available reports, an anomalous lattice compressibility behavior is observed for the high pressure hexagonal phase, characterized by pronounced hardening of *a* axis above 15 GPa. The observed incompressible nature of the hexagonal *a* axis in the pressure range 15-25 GPa is found to be compensated by doubling the compressibility along the *c* axis.

Keywords: - Rare earth sesquioxides, X-ray diffraction, High pressure, phase transition, Rietveld refinement, Crystal structure.