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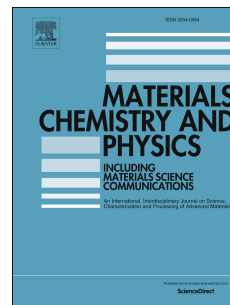
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## Anomalous lattice compressibility of hexagonal $\text{Eu}_2\text{O}_3$

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### Abstract

Monoclinic  $\text{Eu}_2\text{O}_3$  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.

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