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Abstract Submission for COMPRES 2017

Angle-Resolved Polarized Raman Spectroscopy at High Pressures

Raman spectroscopy is an essential experimental technique for probing the lattice dynamics of materials under pressure, and can be used to observe structural phase transformations and develop accurate thermodynamic models. Using angle-resolved Raman spectroscopy with linearly polarized light, vibrational and optical anisotropy of low symmetry materials can be probed to gain further insight into complex material systems. The polarized Raman technique is particularly promising for studying low symmetry minerals relevant to the Earth's mantle such as orthorhombic bridgmanite and olivine, and could shed light on the anisotropic heat transport properties of these materials. However, application of this technique on single crystal samples in diamond anvil cells requires careful consideration of sample and sample chamber geometry to calculate optical interference effects due to reflection and refraction of Raman scattered light at the planar interfaces between the diamond, pressure medium, and sample. In this work, an overview of the high pressure polarized Raman technique is presented. Opportunities and challenges in implementing the technique in high pressure studies of relevant Earth materials are emphasized.