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Anisotropic Transverse Stress in Calcite and Sapphire Measured Using Birefringence[1] GARETH R. TEAR, DAVID J. CHAPMAN, DANIEL E. EAKINS, WILLIAM G. PROUD, Imperial College London — Many significant geological minerals have anisotropic crystal structures leading to material properties that are anisotropic, including compressive elastic behaviour. A non-invasive approach to investigate the directional dependence of transverse stress in these materials during shock compression would supplement current understanding. As many geological minerals are transparent and hence optically anisotropic, measuring the change in birefringence induced by transverse stress in the material offers the possibility of a fast, non-invasive approach to probe transverse behaviour. Shock compression experiments have been performed on a-cut calcite and a-cut sapphire for strain rates of order 105 s-1 and up to longitudinal stresses of 2 GPa for calcite and 12 GPa for sapphire. We present measured changes in birefringence for these materials under shock compression, comparing with current and past literature as well as an in house optical model. The authors would like to thank Mr Steve Johnson and Mr David Pittman for technical support.

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