

Optical Absorbance of Ruby and Fe²⁺-Doped Magnesium Oxide Under Shock Compression.* T. GOTO, THOMAS J. AHRENS, GEORGE R. ROSSMAN, Caltech, and Y. SYONO, Tohoku U.**--Using a 3500 J Xe flash tube for illumination, an internal mirror (imbedded within the sample), and a spectrometer-equipped streak camera, optical absorption spectra of ruby (Al₂O₃:Cr³⁺) and periclase (MgO:Fe²⁺) are measured between 386 and 610 nm to pressures of 46 and 42 GPa, respectively. In ruby, the crystal-field transitions ⁴A_{2g}→⁴T_{2g} and ⁴A_{2g}→⁴T_{1g}, at 555 and 405 nm shift to 503 nm at 46 GPa and 386 nm at 32 GPa, respectively. The Racah parameter, B, decreases from 650 cm⁻¹ at ambient pressure to 580 cm⁻¹ at 39 GPa, indicating an increase in covalency with compression. Iron doped in MgO (0.3 mole %) was obtained in the Fe²⁺ state by heating in vacuo, in the presence of metallic iron at 1200°C. Upon shock compression to 20 to 40 GPa the opacity seen in diamond anvil apparatus by Mao and Bell was not observed. In contrast to the reported shift with pressure of the ultraviolet Fe²⁺-O²⁻ charge transfer band into the visible, a decrease in transmittivity at longer wavelengths is observed. A reduction in transmittivity by a factor of ~4 at 550 nm going to a factor of only 0.8 at 450 nm from 20 to 40 GPa is observed.

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