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**Measurement of optical extinction coefficients in sapphire as a function of the shock pressure** XIANMING ZHOU, JUN LI, JIABO LI, Laboratory for Shock Wave and Detonation Physics Research, Institute of Fluid Physics — Sapphire has been extensively used as a window material for both optical and thermal property measurements of shocked materials. Its optical extinction characteristic under dynamic compression is crucial in understanding the measured physical behaviors. Here we demonstrated a quantitative study of the dynamic optical extinction of sapphire in the shock pressure range from 72 to 183 GPa. Along its <1000> orientation, the optical extinction coefficient ($\alpha$) of sapphire crystal has been in-situ measured at several discrete wavelengths with an optical pyrometer incorporated with a shock-generated bright light source. The significant findings indicated that: (i) the $\alpha$ coefficient increases with the shock pressure but decreases with the wavelength, showing a quite different behavior from that observed in the low-pressure compression in the literature; (ii) the obtained linear relationship between the square-root of $\alpha$ coefficient and the photon energy can be well described by a Mie scattering calculation assuming a particle radii of $\sim$140nm, which suggests that the optical extinction of sapphire is attributed to a light scattering mechanism related with the shock-induced crack-net distribution in this strong brittle material. These quantitative extinction data have provided new insight into the decay nature of thermal radiance histories previously concerned at a metal/sapphire interface, which is crucial for inferring an interfacial equilibrium temperature.

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