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Dynamic reflectance of tin shocked from its beta to BCT phase[1]
GERALD STEVENS, BRANDON LA LONE, LYNN VEESER, DALE TURLEY, National Security Technologies, LLC — Shock-induced phase transitions have historically been inferred by features in loading/unloading velocity wave profiles, which arise due to volume or sound speed differences between phases. In 2010, we used a flash-lamp illuminated multi-band reflectometer to demonstrate that iron, tin, cerium, and gallium have measureable reflectance changes at phase boundaries. We have improved upon our prior technique, utilizing an integrating sphere with an internal xenon flash lamp to illuminate a shocked metal beneath a LiF window. The new reflectance system is insensitive to motion, tilt, or curvature and measures the absolute (not relative) reflectance within five bands centered at 500, 700, 850, 1300, and 1550 nm. We have made dynamic reflectance measurements of tin samples shocked to pressures above and below the beta-bct phase transition using either high explosives or a gas gun. Below the transition, the visible reflectance decreases with pressure. At and above the transition, the visible reflectance increases to values higher than the ambient values. Reflectance can therefore be used to locate the beta-bct phase transition boundary for tin, independent of the velocity wave profile.

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