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Measurements of band gap structure in diamond compressed to 370 GPa[1] ELISEO GAMBOA, LUKE FLETCHER, HAE-JA LEE, ULF ZASTRAU, MAXENCE GAUTHIER, SLAC National Accelerator Laboratory, DIRK GERICKE, Centre for Fusion, Space and Astrophysics, Department of Physics, University of Warwick, Coventry CV4 7AL, United Kingdom, JAN VORBERGER, Max-Planck-Institut für die Physik Komplexer Systeme, 01187 Dresden, Germany, EDUARDO GRANADOS, PHILLIP HEIMANN, JEROME HASTINGS, SIEGFRIED GLENZER, SLAC National Accelerator Laboratory — We present the first measurements of the electronic structure of dynamically compressed diamond demonstrating a widening of the band gap to pressures of up to 370 ± 25 GPa. The 8 keV free electron laser x-ray beam from the Linac Coherently Light Source (LCLS) has been focussed onto a diamond foil compressed by two counter-propagating laser pulses to densities of up to 5.3 g/cm^3 and temperatures of up to 3000 ± 400 K. The x-ray pulse excites a collective interband transition of the valence electrons, leading to a plasmon-like loss. We find good agreement with the observed plasmon shift by including the pressure dependence of the band gap as determined from density functional theory simulations.

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