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Cu Temperature and Density Determination Using X-Ray Absorption Fine Structure at 450 GPa[1] HONG SIO, YUAN PING, FEDERICA COPPARI, ANDY KRYGIER, DAVE BRAUN, STANIMIR BONEV, GREGORY KEMP, DANIEL THORN, MARIUS MILLOT, DAYNE FRATANDUONO, NOBUHIKO IZUMI, HYE-SOOK PARK, MARILYN SCHNEIDER, JAMES MCNANEY, DAVE BRADLEY, WARREN HSING, JON EGGERT, Lawrence Livermore Natl Lab, LAN GAO, KENNETH HILL, PHILLIP EFTHIMION, Princeton Plasma Physics Laboratory — The temperature of dynamically compressed materials is the largest uncertainty in modern equation of state modeling, and developing new tools to measure temperature is important to complement data from existing diffraction and equation-of-state platforms. In experiments performed at the National Ignition Facility (NIF), x-ray absorption fine structure (XAFS) has been measured and used to constrain temperature and density in Cu at 450 GPa. These fine-structure modulations in the x-ray absorption are caused by photoelectron scattering off nearby atoms, and are sensitive to both local atomic spacing and thermal disorder. A new high-resolution crystal spectrometer (HiRAXS) with 3-eV resolution between 8.9 - 9.8 keV was used to measure Cu XAFS signals. Cu XAFS sensitivity to temperature, density, and crystal structure at different temperatures along an isochore will be discussed.

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