Abstract Submitted
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Dynamics of the shock-induced transition from graphite to warm dense diamond and liquid carbon[1] D. KRAUS, B. BARBREL, UC Berkeley, S. FRYDRYCH, J. HELFRICH, G. SCHAUMANN, TU Darmstadt, J. VORBERGER, Max Planck Institut fuer die Physik komplexer Systeme, Dresden, D.O. GERICKE, University of Warwick, L.B. FLETCHER, M. GAUTHIER, S. GOEDE, E. GRANADOS, H.J. LEE, B. NAGLER, E. GAMBOA, A. RAVASIO, W. SCHUMAKER, SLAC National Accelerator Laboratory, T. DOEPPNER, B. BACHMANN, Lawrence Livermore National Laboratory, P. NEUMAYER, GSI Helmholtzzentrum fuer Schwerionenforschung, G. GREGORI, University of Oxford, M. ROTH, TU Darmstadt, S.H. GLENZER, SLAC National Accelerator Laboratory, R.W. FALCONE, UC Berkeley — We present novel experimental observations of the ion structure in warm dense carbon at pressures from 20 to 220 GPa and temperatures of several thousand Kelvins. Our experiments employ x-ray sources at kilo-joule class laser facilities and at the Linac Coherent Light Source to perform spectrally and angularly resolved x-ray scattering from shock-compressed graphite samples[2]. Using different types of graphite and varying drive laser intensity, we were able to probe conditions below and above the melting line, resolving the shock-induced graphite-to-diamond and graphite-to-liquid transitions on nanosecond time scale. Moreover, we have observed the dynamic formation of hexagonal diamond by shock-compression of highly oriented graphite samples.

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[2]D. Kraus et al., Phys. Rev. Lett 111, 255501 (2013)

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