Abstract Submitted
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Transient lattice contraction in the solid to plasma transition of x-ray heated xenon clusters[1] C. BOSTEDT, Argonne, K. FERGUSON, T. GORKHOVER, P.H. BUCKSBAUM, S. BOUTET, J.E. KOGLIN, A. LUTMAN, A. MARINELLI, J. TURNER, Slac, M. BUCHER, P. HO, C. KNIGHT, L. YOUNG, Argonne, H. FUKUZAWA, Y. KUMAGAI, K. UEDA, Tohoku University, K. NAGAYA, Kyoto University, M. MESSERSCHMIDT, NSF BioXFEL STC, G. WILLIAMS, Brookhaven — Any sample in the focus of intense x-ray pulses will be transformed into a nanoplasma within femtoseconds. We have employed the novel two-color two-pulse mode available at the Linac Coherent Light Source free-electron laser to investigate the structural dynamics in nanoparticles upon x-ray exposure. We find that the nanoparticle transiently contracts within the first 80 fs following x-ray irradiation before ultimately disintegrating in a rapid hydrodynamic expansion. The contraction can be attributed to the massive x-ray induced electronic excitation that induces a collective change in the bond character of the nanoparticles. Alternative explanations for the contraction include a compression wave stemming from a rapid surface explosion of the nanoparticle. Computer simulations under way can elucidate the dominant contraction mechanism and yield further insight into the complex x-ray induced dynamics in nanoscale samples.

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