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Controlling explosion dynamics in mixed He/Xe clusters with X-ray double pulses M. ZIEMKIEWICZ, C. BACELLAR, A. CHATTERLEY, J. CRYAN, O. GESSNER, Lawrence Berkeley National Lab, M. MUELLER, D. RUPP, T. MOELLER, TU Berlin, C. JONES, R.M.P. TANYAG, C. BERNANDO, L. GOMEZ, J. KWOK, A. VILESOV, University of Southern California, K. FERGUSON, M. BUCHER, T. GORKHOVER, S. CARRON, J. KRZYWINSKI, A. LUTMAN, A. MARINELLI, T. MAXWELL, J. TURNER, F.-J. DECKER, C. BOSTEDT, SLAC National Accelerator Laboratory — Intense X-ray induced fragmentation dynamics of hybrid systems consisting of Xe structures embedded in large superfluid helium nanodroplets are studied by femtosecond time-resolved ion mass spectrometry. The clusters are photoionized by a pair of intense X-ray pulses from the Linac Coherent Light Source (LCLS), resulting in fragmentation and ejection of ions with kinetic energies of up to several keV. The production of He^{++} is of particular interest as this cation is only formed in the mixed system and not upon X-ray illumination of pure He nanodroplets. It is found that the He^{++} product kinetic energy distribution varies sensitively with the relative timing of the X-ray double pulse, exhibiting complex dynamics as a function of pump-probe delay. Existing models describing similar results for experiments using intense infrared laser pulses are not applicable to this study due to the disparate interactions of intense optical and X-ray fields with matter. Possible phenomena underlying the observed trends are discussed.

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