Abstract Submitted
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Observing electronically induced structural transformations using ultrafast electron crystallography[1] RAMANI K. RAMAN, RYAN A. MURDICK, YOSHIE MUROOKA, ZHENSHENG TAO, TZONG-RU T. HAN, RICHARD J. WORHATCH, SUBHENDRA D. MAHANTI, CHONG-YU RUAN, Michigan State University — We have observed, using ultrafast electron crystallography, the photoinduced fragmentation of isolated Silver nanocrystals excited at the surface plasmon resonance (SPR) at fluences far below their melting / ablation threshold. The fragmentation process at such low fluences is attributed to the strong non-linear coupling of SPR with interband transitions that lead to the creation of local valence instabilities, whose growth and percolation leads to the eventual fragmentation of the nanocrystals. Similar electronically induced structural rearrangement is also seen in graphite, where a fs photoexcitation at 800nm creates transient interlayer sp^3 bonds beyond a threshold fluence (Phys. Rev. Lett. 101, 077401 (2008)). In both graphite and silver, we have observed the creation of strong transient surface voltage along with ejection of photoelectrons from the surface (Appl. Phys. Lett. 95, 181108 (2009)), pointing to the dominant role of charges in driving structural transformations at surface and interfaces.

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