Abstract Submitted
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Electronic Feshbach Resonances created in Soft X-ray–Induced O_2 dissociation ETIENNE GAGNONE, JILA, University of Colorado, ROBIN SANTRA, Argonne National Lab, Illinois, ARVINDER SANDHU, University of Arizona, Tucson, VANDANA SHARMA, WEN LI, JILA, University of Colorado, PHAY HO, Argonne National Lab, Illinois, PREDRAG RANITOVIC, LEW COCKE, Kansas State University, Manhattan , CRAIG HOGLE, MARGARET MURNANE, HENRY KAPTEYN, JILA, University of Colorado — When an atom or molecule is ionized by an x-ray, super-excited states can be created that then decay, or autoionize, by ejecting a second electron from the ion. Here we find that autoionization following soft x-ray photoionization of molecular oxygen follows a complex, multi-step, process[1]. By interrupting the autoionization process using a short laser pulse, we show that autoionization cannot occur until the internuclear separation of the fragments is greater than 30 Ångstroms. As the ion and excited neutral atom separate, we directly observe the birth of a new state. We follow the transformation of electronically bound states of the molecular ion into Feshbach resonances of the neutral oxygen atom that are characterized by both positive and negative binding energies. States with negative binding energies have not been predicted or observed in neutral atoms previously. 1. A. Sandhu et al., "Observing the birth of electronic Feshbach resonances in soft x-ray induced O_2 dissociation," Science 322, 1081 (2008).

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