

Abstract Submitted
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Isotopic effect in bond rearrangement caused by sudden single and multiple ionization of water molecules.¹ MAT LEONARD, A.M. SAYLER, K.D. CARNES, B.D. ESRY, I. BEN-ITZHAK, J.R. Macdonald Laboratory, Department of Physics, Kansas State University — The production of H_2^+ fragments upon dissociation of water molecules involves rearrangements of the molecular bonds. Using fast ions to ionize a water molecule, electrons can be removed on a time scale of 10 attoseconds, thus freezing the nuclear motion. Our earlier experimental results of $\text{H}_2^+ + \text{O}$ production rate showed a strong isotopic dependence, which is about two times more likely than $\text{D}_2^+ + \text{O}$. Recently, we measured a similar ratio for double ionization of water by 1 MeV/amu F^{7+} projectiles. In particular, the H_2O^{2+} dissociation into $\text{H}_2^+ + \text{O}^+$ is about twice as large as $\text{D}_2\text{O}^{2+} \rightarrow \text{D}_2^+ + \text{O}^+$. Finally, we have experimental evidence for H_2^+ formation in triple and quadruple ionization. These first observations of bond rearrangement of multiply ionized molecules indicate a sudden mechanism, i.e. a Franck-Condon-like transition, instead of bonding during the slow dissociation.

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