GEC13-2013-000255

Abstract for an Invited Paper
for the GEC13 Meeting of
the American Physical Society

Imaging of the dissociation dynamics of polyatomic molecules following low-energy electron resonant attachment[1]

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We will present a study that combines experimental data along with theoretical analysis of dissociative electron attachment to carbon dioxide, methanol and uracil. In these studies we demonstrated that an understanding of anion dissociation dynamics beyond simple one-dimensional models is crucial in interpreting the measured angular distributions. Although, for example, several possible dissociation mechanisms involving conical intersections have been identified for the lowest resonance and discussed in the case of CO_2, the most likely scenario points to an initial linear asymmetric stretch motion to geometries where the autodetachment probability is small, followed by bending motion around a conical intersection. We also investigated the dynamics of DEA to methanol for the low-energy Feshbach resonance at 6.5 eV. The angular distributions of the recoiling fragments were found to deviate significantly from the axial recoil approximation that was used previously to accurately describe the dynamics in the analogous 2B1 resonance in water. Observation of the dynamics of dissociative electron attachment (DEA) in biomolecules has recently become possible by momentum imaging of the fragments. Guided by electronic structure and scattering we observed key aspects of the dynamics of ring-breaking dissociation of the transient anion formed upon DEA to the nucleobase uracil.

[1]Work supported by Chemical Sciences Division/BES/DOE.