Imaging the photodissociation dynamics of small hydrocarbon radicals

Content

The photochemistry of small hydrocarbon radicals is of great importance in fundamental processes in Chemistry, such as atmospheric chemistry, hydrocarbon combustion, formation of complex hydrocarbons in the interstellar medium, troposphere chemistry or chemical vapour deposition for diamond growth. Recently we have studied the photodissociation dynamics of the methyl (CH3) radical from the 3s and 3pz Rydberg states by one and two-photon excitation, respectively, using a combination of femtosecond [1] and nanosecond [2] laser pulses and the velocity map and slice ion imaging techniques. A great deal of details about the time-resolved predissociation dynamics of the 3pz state and of the photodissociation dynamics to the final photofragments CH2 + H from the two excited states, have been obtained and the experimental results have been explained by high level ab initio calculations of the potential energy surfaces involved in the photodissociation process [1-3]. More recently, we have studied the photodissociation dynamics of hot and cold ethyl (C2H5) radicals from Rydberg states by absorption of one-photon in the region of 200 nm [4] and at 193 nm [5]. Velocity map imaging of both the H-atoms (C-H bond cleavage) [4,5] and the methyl radicals (C-C bond cleavage) [6] have been measured. A novel mechanism governed by a conical intersection allowing prompt site-specific hydrogen-atom elimination is presented and discussed [4,5]. References

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Contribution Type: Invited talk