PROBING THE REACTION MECHANISMS OF SIMPLE HYDROCARBON RADICALS WITH INFRARED SPECTROSCOPY AND HELIUM NANODROPLETS

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The reactions of simple hydrocarbon radicals (CH_3, C_2H_5, etc,) serve as prototypes for studying many atmospheric, combustion, and hydrogen exchange mechanisms. Despite their apparent simplicity, detailed information concerning the entrance and exit channel portions of their reactive potential energy surfaces is still missing. These regions of the potential have recently been shown to significantly influence the reaction dynamics in both low temperature collisions and near threshold (high energy) reactions. In this contribution we report rotationally resolved infrared spectra for the entrance channel complexes of methyl (CH_3), ethyl (C_2H_5), and allyl (C_3H_5) radicals with HF and HCN, stabilized in helium nanodroplets and interrogated in the region of the HF and HCN stretching fundamentals. Theoretical calculations are also presented to help elucidate the structure and energetics of these complexes.