VIBRATIONAL PREDISSOCIATION DYNAMICS OF THE HYDROGEN BONDED OH-C_2H_2 REACTANT COMPLEX

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Reaction of acetylene with the hydroxyl radical is the only significant loss of this alkyene in the atmosphere. Previous studies have shown the reaction to have pressure dependent kinetics and several different reaction intermediates and products. Under atmospheric conditions, the rate of reaction may be influenced by a hydrogen bonded adduct between the two partners in the entrance channel to reaction. The infrared action spectrum of this complex between C_2H_2 and OH has been recorded in the OH overtone region near 1.4 μm. The rotationally resolved OH overtone band is centered at 6885.6 cm^{-1}, and analysis reveals a T-shaped, π-hydrogen bonded structure for the OH-C_2H_2 complex. Following IR excitation, the complex can undergo vibrational predissociation or reaction via addition or hydrogen abstraction pathways. Vibrational predissociation produces OH fragments which are detected by laser induced fluorescence on the OH A-X $(0,1)$ transition. The highest observed OH $(v = 1)$ product rotational state, j_{OH}=23/2, ω=3/2, resulting from a vibration to rotation/translation process, allows for determination of an upper limit of the binding energy, $D_0 \leq 995$ cm^{-1}. The OH fragments also strongly populate j_{OH}=9/2 and 11/2 states, indicating a vibration-vibration channel likely arising from energy transfer to the ν_2 C-C stretch of the acetylene partner.