PHOTODISSOCIATION OF VINYL RADICAL (C\textsubscript{2}H\textsubscript{3}) VIA THE FIRST EXCITED STATE: THE C\textsubscript{2}H\textsubscript{2}(X^{1}\Sigma_{g}^{+}) + H CHANNEL

KESHENG XU and JINGSONG ZHANG, Department of Chemistry and Air Pollution Research Center, University of California, Riverside, CA 92521-0403.

Photodissociation of vinyl radical via its first excited \( \tilde{A}^{2}A'' \) state has been studied by using high-n Rydberg-atom time-of-flight technique at 327.4 and 366.2 nm photolysis wavelengths. Center-of-mass (CM) translational energy distributions of the H atom and ground (\( X^{1}\Sigma_{g}^{+} \)) state acetylene photofragments reveal a small product translational energy release and two highly inverted vibrational progressions of C\textsubscript{2}H\textsubscript{2}(X^{1}\Sigma_{g}^{+}) (most likely the C-C stretch and its combination band with C-H bend, with C-C stretch quanta up to 7). Anisotropic H-atom angular distributions are observed at the two excitation wavelengths, indicating a short excited \( \tilde{A}^{2}A'' \) state lifetime. Implication of the C\textsubscript{2}H\textsubscript{2} vibrational state distribution and photodissociation dynamics of C\textsubscript{2}H\textsubscript{3} in the first excited state are discussed. D\textsubscript{0}(C\textsubscript{2}H\textsubscript{2}-H) = 33.0 \pm 0.5 kcal/mol is derived, in good agreement with previous studies.