

STUDY OF HIGHLY-PREDISSOCIATIVE STATES OF FREE RADICALS USING TWO-COLOR RESONANT FOUR-WAVE MIXING TECHNIQUE

YUAN-PERN LEE, *Department of Chemistry, National Tsing Hua University, Hsinchu, Taiwan 30043.*

We demonstrate an application of two-color resonant four-wave mixing (TC-RFWM) spectroscopy to detect highly predissociative levels of the $C^2\Sigma^+$ AND $D^2\Pi$ states of CH in a hostile environment of an oxyacetylene flame. The 1-1 band of the $C - X$ transition is detected with the probe and the grating wavelengths in resonance with the $A^2\Delta - X^2\Pi$ and $C^2\Sigma^+ - X^2\Pi$ transitions, respectively. Six branches of the $C - X$ (1-1) system are spectrally resolved for the first time; in total 124 lines detected in this work correspond to excitation of the $C^2\Sigma^+$ ($v = 1$) state up to $N' = 23$. Observed wave numbers are fitted to yield improved spectral parameters of the $C^2\Sigma^+$ state. The D state was observed by using two grating (probe) beams in resonance with the $D^2\Pi - B^2\Sigma^-$ transition and the pump beam in resonance with a selected $B^2\Sigma^- - X^2\Pi$ transition. A total of 86 lines associated with transitions to the $D^2\Pi$ ($v = 0$) state with rotational quantum number N' up to 16 were detected; parameters for centrifugal-distortion (D, H), spin-rotation interaction (γ), and Λ -doubling (p, q, q_0) of the $D^2\Pi$ ($v = 0$) state were deduced for the first time. The predissociative line width is about 2 cm^{-1} for $N' = 1$ and gradually increases to 7 cm^{-1} for $N' = 15$. Predissociation mechanisms of both the C and the D states are discussed. If time permits, other systems will be briefly described.