ENERGY AND LIFETIME OF HIGHLY PREDISSOCIATIVE LEVELS OF THE CH $C\ ^2\Sigma^+$ AND $D\ ^2\Pi$ STATES DETERMINED WITH TWO-COLOR RESONANT FOUR-WAVE MIXING SPECTROSCOPY

YUAN-PERN LEE, XINGHUA LI, AWADHESH KUMAR, CHIH-CHANG SHIAO, *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 system are spectrally resolved for the first time; in total 124 lines detected in this work correspond to excitation of the C (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 beams in resonance with the $D\ ^2\Pi$ - $B\ ^2\Sigma^-$ transition and the pump beam in resonance with a known $B\ ^2\Sigma^-$ - $X\ ^2\Pi$ transition. A total of 86 lines associating with transitions to the D (v = 0) state with rotational quantum number N' up to 16 were detected; spectral parameters of the $D\ ^2\Pi$ (v = 0) state were determined. Linewidth, broadened due to predissociation, up to 6 cm^{-1} were observed. Predissociation mechanisms of both the C and the D states are discussed.