NEAR-INFRARED HIGH RESOLUTION DIODE LASER SPECTROSCOPY OF METHYLENE

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High resolution spectra of the methylene (CH_2) $\tilde{b}^1B_1 \leftarrow \tilde{a}^1A_1$ electronic transition in the vicinity of $1\mu m$ have been obtained using a new diode-laser-based spectrometer. Interest in studying CH_2 comes from the complicated interplay between spin-orbit interaction and Renner-Teller effects in the $\tilde{a}^1A_1$, $\tilde{b}^1B_1$, which become degenerate at linearity and the background $\tilde{X}^3B_1$ states. This results in a highly perturbed spectrum. The spectroscopic investigations of levels near to the barrier to linearity of the singlet states is crucial to help unravel the perturbation mechanisms in this system as well as to refine the potential energy surfaces of CH_2. Here, we report the first CH_2 electronic spectrum in the region between $1.016\mu m$ and $0.993\mu m$. The upper levels of the observed structure are approximately just $1000\mathrm{cm}^{-1}$ above the barrier to linearity. This spectrum should reveal important information on the internal dynamics of CH_2. Additionally, we demonstrate the general utility of near infrared diode lasers in high resolution spectroscopy. Progress on the analysis of this spectrum and the experiment will be presented.

Acknowledgments:
The experimental work was carried out at Brookhaven National Laboratory under Contract No. DE-AC02-76CH00016 with the U.S. Department of Energy and supported by its Division of Chemical Sciences, Office of Basic Energy Sciences. BCC also thanks National Science Council, Taiwan for its support of this work under Grant No. NSC86-2112-M-008-032-T.