SLIT-JET DISCHARGE STUDIES OF POLYACETYLENIC MOLECULES: SYNTHESIS AND HIGH RESOLUTION INFRARED SPECTROSCOPY OF DIACETYLENE

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Polyacetylenic molecules play an important role in both combustion chemistry as well as chemistry of the interstellar medium. This talk presents first high resolution infrared spectroscopic efforts on the simplest jet-cooled polyacetylene, namely diacetylene (C_4H_2). Specifically, the fundamental anti-symmetric CH stretching mode (near 3333 cm^{-1}) and several hot combination bands of diacetylene have been investigated under sub-Doppler, jet cooled conditions in a pulsed supersonic slit discharge. Local Coriolis perturbations in the fundamental anti-symmetric CH stretch manifold are observed and analyzed. Six hot bands are observed, including the HCC bending mode (v_8) not observed in previous room temperature studies.[a] The observation of these hot bands under rotationally jet cooled conditions (T_{rot}=15.7(4) K) indicate the presence of highly non-equilibrium relaxation processes between vibration and rotation.

[a] G. Guelachvili, A. M. Craig, and D. A. Ramsay, J. Mol. Spectrosc. 105, 156 (1984)