ROTATIONAL AND VIBRATIONAL ENERGY TRANSFER FROM THE FIRST OVERTONE STRECH OF ACETYLENE

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Gas lasers that are optically pumped by solid state devices are currently being considered for applications that require high powers and high beam quality. Optical pumping in the 1-2 μm region is of interest as there are efficient diode laser sources that operate in this spectral range. An optically pumped C_2H_2 laser was recently demonstrated by Wolfgang et al. at the University of New Mexico. Excitation of the CH overtone transition (v_{CH}=2) at 1.52 μm yielded lasing on an asymmetric stretch combination band centered at 3.1 μm. Collisional energy transfer data for the v_{CH}=2 level is needed for analysis and modeling of the laser performance. Although there have been numerous studies of energy transfer for vibrationally excited acetylene, the v_{CH}=2 level has received very little attention. We are currently examining state-to-state ro-vibrational energy transfer processes for v_{CH}=2 in self-collisions using a pulsed IR pump- UV probe technique. Pure rotational transfer has been characterized and rapid vibrational transfer has also been observed. Identification of the collisionally populated vibrational levels and measurements of the transfer rate constants are in progress.