OVERTONE STATES STUDIED BY LASER INDUCED DISPERSED FLUORESCENCE IN THE GROUND ELECTRONIC STATE. APPLICATION TO HCCH AND H_2O MOLECULES

DMITRI PERMOGOROV, MARIA SAARINEN, LAURI HALONEN, *Laboratory of Physical Chemistry, P. O. Box 55 (A. I. Virtasen aukio 1), FIN-00014 University of Helsinki, Finland.*

The method of laser induced fluorescence (LIF) has been applied to study highly excited vibrational molecular overtones in the ground electronic state in the near infrared range. This method offers some advantages compared to conventional one-photon absorption techniques. It gives us an access to vibrational states that cannot be populated by one-photon transitions from the ground state and it permits to study the processes of rovibrational energy redistribution by collisions. Up to now the LIF method has been successfully utilised for electronic transitions in atoms and molecules. We have developed a dispersed laser induced fluorescence method for the detection of weak rovibrational transitions in the electronic ground state and applied it to the HCCH and H_2O molecules. The cell containing the sample has been placed inside a Ti:Sapphire ring laser cavity. Fluorescence signal has been collected by an efficient optics and directed into a high resolution FTIR-spectrometer. By pumping different single vibration-rotation lines in the near infrared range we have measured the dispersed fluorescence from third stretching overtone in acetylene and from the second stretching overtone in water. The dispersed fluorescence has been detected in the 2800 - 3700 cm^{-1} range in both cases. Many collision-induced rovibrational transitions from the upper state have been observed per one pumping line for both molecules. The work on the development of the experimental set-up and on collision-induced transitions analysis is in progress and the latest results will be presented at the conference.