

PUMP AND PROBE SPECTROSCOPY OF CH₃F-(*ortho*-H₂)_{*n*} CLUSTERS IN SOLID PARAHYDROGEN BY USING TWO CW-IR QUANTUM CASCADE LASERS

HIROYUKI KAWASAKI, ASAO MIZOGUCHI, HIDETO KANAMORI, *Department of Physics, Tokyo Institute of Technology, Tokyo, Japan.*

The absorption spectrum of the ν_3 (C-F stretching) mode of CH₃F in solid *para*-H₂ by FTIR showed a series of equal interval peaks^a. Their interpretation was that the *n*-th peak of this series was due to CH₃F-(*ortho*-H₂)_{*n*} clusters which were formed CH₃F and *n*'s *ortho*-H₂ in first nearest neighbor sites of the *para*-H₂ crystal with *hcp* structure. In order to understand this system in more detail, we have studied these peaks, especially *n* = 0 – 3 corresponding to 1037 - 1041 cm⁻¹, by using high-resolution and high-sensitive infrared quantum cascade laser (QCL) spectroscopy. Before now, we have observed photochromic phenomena of these peaks by taking an advantage of the high brightness of the laser^b. However, it has not been revealed what kind of mechanism is undergoing in these processes. In order to solve this problem we introduced two cw-IR QCLs for pump and probe experiment. While the pumping laser is breaching a certain peak with high power, the probing laser is monitoring the increase of other peaks by rapid scan method. The time resolution of this spectroscopy is 5 msec. The new precise kinetic information will help us to understand the molecular interaction in solid *para*-H₂.

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^bA. R. W. McKellar, A. Mizoguchi, and H. Kanamori, Phys. Chem. Chem. Phys. 13 (2011) 11587-11589