IR-IR DOUBLE RESONANCE EXPERIMENT OF CH_3F-($ortho$-H_2)$_n$ CLUSTERS IN SOLID $para$-H_2

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FTIR absorption spectrum of the ν_3 vibrational band of CH_3F in solid $para$-H_2 shows a series of lines at regular intervals, which could be assigned to clusters forming CH_3F-($ortho$-H_2)$_n$, with n = 0 to 12[a]. However, such a distinct feature appears only in the ν_3 mode but is not observed in the other vibrational modes. In order to solve this problem, we applied IR-IR double resonance spectroscopy using 3 μm OPO laser and 9 μm QC laser to the vibrational bands of CH_3F in solid $para$-H_2. Because, very recently, high resolution cw-QC laser spectroscopy demonstrated a perfect bleaching effect on a spectral peak in ν_3 mode[b]. By bleaching the n=1 component of the ν_3 band at 9 μm, we can see a corresponding depletion in the broad spectral feature of the ν_1 band at 3 μm. This simultaneous disappearance of the spectral peaks is a proof of the CH_3F-($ortho$-H_2)$_n$ cluster model, and it suggests that all the vibrational bands should be explained by the same model.

[a] K. Yoshioka and D. T. Anderson, *J. Chem. Phys.* 119, 4731(2003)
[b] A. R. W. McKellar, A. Mizoguchi, and H. Kanamori, *Phys. Chem. Chem. Phys.*, 13, 11587 (2011)