IN-SITU PHOTOLYSIS OF METHYL IODIDE IN SOLID PARA-HYDROGEN AND SOLID ORTHO-DEUTERIUM

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Products of $in\text{-}situ$ photolysis of methyl iodide isolated in solid para-hydrogen and solid ortho-deuterium were investigated by high-resolution FTIR spectroscopy. The ν_3 and ν_4 vibrational transitions of a methyl radical and the $^2P_{1/2} \leftarrow^2 P_{3/2}$ transition of an iodine atom were clearly observed in both solids after the photolysis, which indicates a small cage effect in hydrogen crystals. The vibrational transitions of the methyl radical showed a rotational structure subjected to crystal field splittings. Temperature dependence of the spectra allowed us to analyze the spectral fine structure completely based on our crystal field theory.[a] On the other hand, the magnetic dipole transition of the iodine atom showed a rotational satellite induced by hydrogen molecules. The rotational satellite indictates a strong electron-roton coupling in solid hydrogen. Details of the analysis will be discussed.

[a] T. Momose, H. Hoshina, M. Fushitani, and H. Katsuki, *Vib. Spectrosco.* **34**, 95 (2004).