MATRIX ISOLATION SPECTROSCOPY IN SOLID PARAHYDROGEN: INFRARED SPECTRSOSCOPY OF SF_6 AND ITS CLUSTERS

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During the past several years we have been utilizing parahydrogen crystal as a new matrix for matrix isolation spectroscopy.[a] Most of the observed spectral lines are much sharper than those observed in the conventional matrices, which makes parahydrogen crystal an excellent host medium for the spectroscopic study of the rovibrational state of guest molecules and the kinetic study of chemical reactions of atoms, molecules and clusters in solid state. In this paper we will present high-resolution infrared spectroscopy of SF_6 and its clusters in solid parahydrogen. The dimer and trimer of SF_6 in parahydrogen crystal show a rather broad doublet and a triplet at around 940cm^{-1}, which can be associated with the diople-induced dipole interaction. The monomer, on the other hand, shows sharp spectral lines with complicated spectral structures. The spectral structure is interpreted in terms of the rovibrational transition of the nearly free rotor, which is subjected to the crystal field splitting. The spectrum is now being studied with high-resolution spectroscopy for the quantitative analysis as in the case of methane in parahydrogen system.[b]

[a] T. Momose and T. Shida, *Bull. Chem. Soc. Jpn.* **71**(1), 1 (1998).
[b] T. Momose, M. Miki, T. Wakabayashi, T. Shida, M. -C. Chan, S. S. Lee and T. Oka, *J. Chem. Phys.* **107**(19), 7707 (1997).