INFRARED SPECTROSCOPY OF CH_2CL IN SOLID PARAHYDROGEN

YUKI MIYAMOTO, *Division of Chemistry, Graduate School of Science, Kyoto University, Kyoto 606-8502, Japan*; and TAKAMASA MOMOSE, *Department of Chemistry, The University of British Columbia, Vancouver, B.C., V6T1Z1, Canada*.

Infrared spectra of the chloromethyl radical (CH_2Cl) isolated in solid parahydrogen has been reported. The radical was produced by *in situ* UV photolysis of chloroiodomethane (CH_2ClI) in solid parahydrogen. Infrared absorption of the ν_3 (CCl stretch), ν_2 (CH_2 scissors), and ν_1 (CH_2 symmetric-stretch) modes of CH_2Cl were clearly observed. The matrix shift of the ν_1 band is -6 cm^{-1} relative to the gas phase band origin. Fine spectral features in the infrared absorption spectra reveal that the radical exhibits uni-axial quantized rotation along molecular *a*-axis in solid parahydrogen. The temporal change of the infrared absorption intensity indicates that the nuclear spin conversion between para ($I = 0$) and ortho ($I = 1$) spin modifications of the radical takes place in solid parahydrogen at 3.6 K. The conversion rate was determine to be 0.0046 min^{-1}, which is comparable to the conversion rate between the $J = 1, I = 1$ and $J = 0, I = 2$ states of CH_4 in solid parahydrogen. We did not observe any significant change of the intensity of the CH_2Cl radical for a few days in solid parahydrogen, which indicates that there is no tunneling reaction between CH_2Cl and H_2 at 3.6 K.