HIGH-RESOLUTION INFRARED SPECTROSCOPY OF HCl AND DCl IN SOLID PARAHYDROGEN

DAVID T. ANDERSON, *Department of Chemistry, University of Wyoming, Laramie, WY 82071-3838*; ROBERT J. HINDE, *Department of Chemistry, University of Tennessee, Knoxville, TN 37966-1600*; SIMON TAM, and MARIO E. FAJARDO, *Propulsion Directorate, US Air Force Research Laboratory, AFRL/PRSP, Edwards Air Force Base, CA 93524-7680*.

The infrared spectroscopy and dynamics of HCl and DCl in solid parahydrogen were investigated using high-resolution FTIR spectroscopic methods. The infrared rovibrational spectra of the HCl and DCl monomers in solid parahydrogen closely resemble the corresponding low temperature gas phase spectra, indicating that the gas phase vibrational and rotational quantum numbers of the impurity are conserved within the parahydrogen solid. In addition, the $Q_1(0)$ H_2 transition that is infrared forbidden in pure parahydrogen is detected in the HCl doped parahydrogen samples. HCl induced rovibrational transitions involving coopertive transtions of pH_2-HCl pairs within the solid are also observed. Cooperative transitions have long been studied for isotopic and rotational impurities in parahydrogen, but these are the first cooperative transitions to be assigned to a chemical impurity in solid parahydrogen.