

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

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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 cooperative transitions of pH₂-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.