INFRARED-ACTIVE VIBRON BANDS ASSOCIATED WITH RARE GAS SUBSTITUTIONAL IMPURITIES IN SOLID HYDROGEN

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Solid para-hydrogen (pH_2) crystals doped with part per million concentrations of rare gas (Rg) atoms display a new zero phonon absorption feature which correlates with the pH_2 pure vibrational $Q_1(0)$ transition. This Rg induced $Q_1(0)$ absorption has been studied at high resolution for Ne, Ar, Kr, and Xe doped pH_2 crystals. The more polarizable the Rg atom, the more intense and red shifted is the induced pH_2 $Q_1(0)$ feature. The frequency and lineshape of the transition provides information on how localized the vibron is around the Rg impurity. Comparison of the experimental data with a recent theoretical model is very favourable.[a] In addition, the Rg atom perturbs the $S_1(0)$ pH_2 transition resulting in peaks that show fine structure which is interpreted as a lifting in the m_J degeneracy of this J=2 upper state. Preliminary studies of Xe atom doped ortho-deuterium will also be presented and discussed.

[a]R. J. Hinde, J. Chem. Phys. 119, 6 (2003).