OBSERVATION OF NEW SHARP TRANSITIONS IN PARAHYDROGEN CRYSTALS DOPED WITH METHANE

C. MICHAEL LINDSAY and TAKESHI OKA, *Department of Chemistry, Department of Astronomy & Astrophysics, and the Enrico Fermi Institute, The University of Chicago, Chicago IL, 60637, USA*; TAKAMASA MOMOSE, *Division of Chemistry, Graduate School of Science, Kyoto University, Kyoto 606-8502, Japan*.

In the course of studying ionized methane/hydrogen clusters in solid parahydrogen crystals, we accidentally stumbled upon a new set of infrared transitions in the crystal, apparently induced by the methane in the crystal (before ionization). Over 80 sharp absorption features ($\Delta\nu \sim 100$ MHz) spanning 2 cm^{-1} were observed in the region between hydrogen's $Q_1(0)$ and $Q_1(1)$ vibrational transitions. The spectroscopy of parahydrogen crystals in this region is well understood, and it was a complete surprise to observe the appearance of new transitions. In this talk we present the data and discuss our current progress in the understanding of this very unexpected spectrum.