

## CO IN SOLID PARAHYDROGEN: A MOLECULAR THERMOMETER

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We utilize reversible temperature dependent changes in the infrared absorption spectrum of CO molecules in solid parahydrogen (pH<sub>2</sub>) to probe the temperature profiles of the matrices during deposition. The intensity of a well resolved absorption feature near 2135 cm<sup>-1</sup> shows a monotonic increase with temperature over the 2 to 5 K range. The initial state of this transition is estimated to be 8 K above the ground state of CO/pH<sub>2</sub>. During the deposition of 100 PPM CO/pH<sub>2</sub> samples, we detect temperature gradients of order 10 K/cm in samples subjected to estimated heat loads of a few milliwatts per square centimeter. The resulting estimated thermal conductivities range from 0.0001 to 0.001 W/cm-K, four orders of magnitude lower than the conductivity of single crystal solid pH<sub>2</sub>, and more than two orders of magnitude lower than previously measured for pH<sub>2</sub> solids doped with 100 PPM concentrations of heavy impurities <sup>a</sup>.

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<sup>a</sup>V.G. Manzhelli, et al., *Low Temp. Phys.* v22, p131 (1996).