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Hydrogen at Extreme Conditions SUBRAMANIAN NATARAJAN, ALEXANDER GONCHAROV, SOMAYAZULU MADDURY, RUSSELL HEMLEY, Geophysical Laboratory, Carnegie Institution of Washington, Washington DC 20015 — Vast regions of the P-T phase diagram of H_2, especially in the high P-T region, remain to be explored for melting behavior and exotic phenomena related to disassociation of the H_2 molecule, metallicity and superconductivity. In recent years, few experiments employing either laser-heating or resistive heating techniques in conjunction with in situ spectroscopic experiments using Diamond Anvil Cells (DAC) have been reported attempting to address some of these. A key problem that faces experimenters is to confine the hot and reactive H_2 in the small DAC sample chamber at high pressures long enough to make meaningful measurements of physical properties. Recently, we have made considerable progress in confining hot and dense hydrogen while not compromising on the ability to make spectroscopic measurements using a complex sample assembly. With this, it has been possible to perform in situ Raman spectroscopy on H_2 and D_2 while simultaneously doing double-sided laser heating at P-T conditions of more than 1Mbar and 1500K. Typically, we are now able to perform laser heating and in situ Raman spectroscopy over several heating/cooling cycles without loss of H_2 in the Mbar range. Results of these experiments will be presented; along with details of the methodology we adopted to successfully confine hot and dense hydrogen.

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