Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

High pressure stability of hydrazine (H_2N-NH_2): Implications for energetic hydronitrogen compounds RAJA CHELLAPPA, DANA DATTELBAUM, Los Alamos National Laboratory, ZHENXIAN LIU, U2A Beamline, National Synchrotron Light Source — Hydrazine (H_2N-NH_2) is a metastable, high energy density molecule that is relevant to planetary physics and plays an important role in industrial synthesis and propellant applications. Theoretical calculations have predicted the existence of "hydronitrogen" extended solids that hold great potential as a high energy density material (HEDM). Exploring the high pressure-temperature ($P-T$) stability of hydrazine will provide crucial insights into hydrogen bonded -N-H networks under these conditions. Further, related simple molecules such as CH_4, NH_3, CO, and CO_2 have been shown to have rich high $P-T$ phase diagrams, often forming extended amorphous solids. Here, we report the first comprehensive study of hydrazine to 50 GPa at ambient temperature, using both *in situ* vibrational spectroscopy and synchrotron x-ray diffraction to elucidate structural changes driven by compression. Liquid hydrazine solidifies into a monoclinic structure at 0.5 GPa that is isomorphous with the low-T solid phase. Further compression drives structural reordering and at least 2 phase transformations to 20 GPa, with complex anisotropic hydrogen bonding interactions. Surprisingly, no evidence for the formation of extended amorphous solids was observed to the highest pressure studied.

Raja Chellappa
Los Alamos National Laboratory

Date submitted: 22 Feb 2013 Electronic form version 1.4