Simultaneous Ultrasonic Interferometry and in-situ X-ray Studies on Forsterite (Mg_2SiO_4-olivine): P-V-Vp-Vs-T Measurements to 8 GPa and 1300 K	X17B1

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We have conducted acoustic wave velocities measurements and equation of state (P-V-T) studies on forsterite (Mg_2SiO_4-olivine) using simultaneous ultrasonic interfrometry and in-situ X-ray diffraction techniques in a DIA-type, cubic anvil high pressure apparatus (SAM85) installed at beamline X17B of the National Synchrotron Light Source at the Brookhaven National Laboratory. The polycrystalline specimen (G717) was hot-pressed at 6 GPa and 1400 K in a girdle- anvil, high-pressure apparatus. The sample was identified as single phase of forsterite by X-ray diffraction with a bulk density of 3.20 g/cm^3 (0.3% porosity). Compressional and shear wave velocities at ambient P and T agree with single crystal data (Kumazawa and Anderson, 1969) within 1%. High P and T ultrasonic measurements in the SAM-85 apparatus are implemented by mounting an acoustic transducer at the back of the WC anvil and enclosing alumina as extended buffer rod inside the cubic boron epoxy pressure medium. The sample is surrounded by NaCl and BN to minimize non-hydrostatic stress. X-ray diffraction spectra from both the sample and NaCl were recorded at elevated pressures and temperatures from which the unit cell volumes of the sample and cell pressures were retrieved. The temperatures were measured using thermocouples adjacent to the sample. The experimental P-T path has been designed to minimize non-hydrostaticity and to optimize acoustic signals. Complete P-V-T and Vp and Vs data for the specimen G717 have been collected up to 8 GPa and 1300 K with dense coverage in P-T space by performing a few compression/heating and decompression/cooling cycles below these conditions. Combining P-V-T and acoustic data will provide the absolute pressure scale and precise determination of elastic moduli K and G and their pressure and temperature. These data are very important parameters needed for modelling mantle compositions and interpreting the 410 km discontinuity in the Earth's transition zone.