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In-situ **Raman Spectroscopic Investigation of Relaxor Multiferroic $Pb(Fe_{0.5}Nb_{0.5})O_3$ under High Pressure and Temperature Conditions**

BRANDON WILFONG, Washington College, 300 Washington Ave. Chestertown, MD 21620, USA, M. AHART, S.A. GRAMSCH, Geophysical Laboratory, Carnegie Institution of Washington, 5251 Broad Branch Rd. NW, Washington D.C. 20015, USA, X. LI, H. LUO, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai 201800, China, C. STOCK, School of Physics and Astronomy, University of Edinburgh, Edinburgh EH9 3JZ, United Kingdom, R.J. HEMLEY, Geophysical Laboratory, Carnegie Institution of Washington, 5251 Broad Branch Rd. NW, Washington D.C. 20015, USA — The vibrational and structural properties of lead ferroniobate, $Pb(Fe_{0.5}Nb_{0.5})O_3$, have been investigated using Raman spectroscopy up to 40 GPa and up to 415 K at selected pressures. Three phase transitions were noted via the pressure evolution at 5.5, 8.7 and 24 GPa at room temperature, respectively. The temperature dependencies of the Raman spectra indicated two phase transitions at 1.5 GPa, 335 and 365 K, which support the appearance of an intermediate tetragonal *P4mm* phase between the ferroelectric *R3m* and paraelectric *Pm-3m* phases. At 2.5, 3.9 and 7.4 GPa, the system showed one phase transition with temperature evolution at 337, 348 and 332 K respectively. With this set of data, a $P-T$ phase diagram was compiled to provide further insight into the magnetoelectric coupling and allow comparison to other systems in order to elucidate the impact of magnetic order on relaxor systems.

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