Abstract Submitted
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Pressure-induced transitions in ferroelectric single-crystal $\mathbf{PbZr_{0.54}Ti_{0.46}O_3}$[1] MUHTAR AHART, R.E. COHEN, RUSSELL J. HEMLEY, Geophysical Laboratory, Carnegie Institution of Washington, 5251 Broad Branch Rd., NW, Washington DC20015 — Ceramics of $PbZr_{(1-x)}Ti_xO_3$ (PZT) are widely used in many modern electromechanical transducers. Because single crystals of these materials are difficult to grow, many intrinsic physical properties have not been well understood. Recent breakthroughs in the growth of PZT single crystals have allowed us to study their fundamental physical properties. Here, we study the pressure induced phase transitions in $PbZr_{0.54}Ti_{0.46}O_3$ single crystal by means of combined high-pressure Raman scattering and x-ray diffraction. Our Raman results indicate that the structural transition at 3 GPa is driven by soft optical phonons, and is accompanied by the appearance of a sharp peak near 370 cm^{-1} above 3 GPa. We also observe a new structural transition occurring above 27 GPa associated with a drastic change of the Raman spectrum. The pressure evolution of the diffraction patterns for $PbZr_{0.54}Ti_{0.46}O_3$ show obvious splitting above 27 GPa, particularly for the pseudo-cubic [111] and [220] diffraction peaks, the results indicate a lowering symmetry transition in $PbZr_{0.54}Ti_{0.46}O_3$. We propose that the second transition is from rhombohedral to orthorhombic induced by a pressure above 27 GPa.

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