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Relaxor ferroelectrics materials under high pressure

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The rich phase diagrams from both relaxor and normal ferroelectrics under high pressure, stimulate us to study the pressure effect on the relaxor-PbTiO₃ (PT) systems, to check whether the high pressure cubic structure will turn to low symmetry structure upon strong compression is the common behaviors for relaxor ferroelectrics materials. Furthermore, a complete phase diagram study of pressure-temperature effect on structure will allow us to explore the limitation on applications of relaxor-PT material devices under harsh environment involving in high pressure and high temperature conditions. Structure evolution and phase transition of several solid solution ferroelectrics, such as Pb(YbNb)O₃-PT (PYN-PT), have been studied using in situ synchrotron X-ray diffraction (XRD) and Raman spectroscopy techniques under high pressure and high temperature conditions. XRD results show pressure induced phase transitions to a cubic phase, while the persistence of Raman spectroscopy in the full pressure range indicates its local distortion. A pressure-temperature phase diagram is further constructed to determine the stability region of the ferroelectric phase. The results provide useful guidance for the applications of this kind of high Curie temperature ferroelectric crystal under extreme conditions, and extra clue to synthesis of ferroelectric materials with tailored properties.

[1] L. Kong, L. Wang et al, *Appl. Phys. Lett.* 101, 062904 (2012), [2] L. Kong, et al, *J. Appl. Phys.* 114, 144106 (2013)

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