The orthorhombic-tetragonal phase transition of PbxBa1-xNb2O6 tungsten-bronze ferroelectric: a Raman scattering investigation

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Abstract

Tungsten-bronze (TB) oxygen octahedra ferroelectric materials have been subject of intense researches mainly in the concentration range around the morphotropic phase boundary (MPB), where dielectric, piezoelectric, pyroelectric and electrooptical coefficients are enhanced. Lead barium niobate, PbxBa1-xNb2O6 (PBN), belongs to the TB-type family. PBN presents a tetragonal paraelectric phase (point group 4/mmm) above its Curie point and two ferroelectric phases below it: orthorhombic (m2m) and tetragonal (4mm). The nearly vertical MPB located at approximately x 0.63 separates those ferroelectric phases. Raman spectra of the tungsten-bronze oxygen octahedra ferroelectric lead barium niobate were recorded between 10 and 700 K. The investigated samples, with x = 0.7 and 0.6, show a ferro-paraelectric phase transition in this temperature range. Wide bands and a central mode characterize Raman spectra. By considering the disorder and temperature effects in the profile of the Raman bands, clear evidence of the structural transformation was observed in the temperature dependence of both the mode energy of the vibrational modes and the central mode.