MAR12-2011-000963

Abstract for an Invited Paper
for the MAR12 Meeting of
the American Physical Society

A-site ion vibrational modes in ABO3 polar perovskites

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It is well known that Pb(B'B")O3 family of complex perovskites contains materials with very useful dielectric, piezoelectric and ferroelectric properties. The overall electromechanical response of these system is believed to be related to their characteristic micro- to nanoscale structural correlations (chemical clusters, polar nanoregions or nanotwins). At the level of the ABO3 unit cell, the remarkable polarizability of these materials originates from lead-ion displacements, and the anharmonic motion of these ions, loosely linked to the core oxygen octahedra network, largely dominates in the low-frequency phonon modes in the system. Therefore, the investigation of the low-frequency phonon modes in these systems is of a great importance. The aim of this contribution is to report recent experimental studies of such low-frequency vibrations by inelastic X-ray, neutron and light scattering techniques, in materials like lead zirconate titanate, lead magnesium niobium titanate or lead titanate. In particular, attention will be payed to our recent inelastic X-ray scattering studies of PZT lattice dynamics.