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Soft mode dispersion and 'waterfall' phenomenon in relaxors revisited

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Abstract

Results of recent inelastic neutron scattering studies of lead-based relaxor ferroelectrics by Gvasaliya et al. [J. Phys.: Condens. Matter 17, 4343 (2005); J. Phys.: Condens. Matter 19, 016219 (2007)] have put in question the existence of the "waterfall" anomaly–an apparent vertical dispersion segment joining the TA and TO branches–observed earlier in low-energy [ξ00] phonon dispersion curves of these materials. In the present article, we revie er with the outcome set-up as Gvasaliy tal artefact. We a a et al., by explo rse optic branch f closely.

Keywor on scattering

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Notes

Notes

1. In the rest of this article, we use reduced (dimensionless) phonon wave vectors expressed in reciprocal lattice units (r.l.u.) given by $c^* = 2\pi/c$, (e.g. for PMN, $c = 4.04$ Å, i.e. $c^* = 2\pi/c = 1.555$ Å^{-1}).

2. First two hypotheses are close to those invoked in Ref. 17.

3. Apar gnometric function

4. This in the GHz regio is article.

5. We h be indepen

6. In principle, PMN is known to grow also, for example in pyrochlore structure, but in this case both the lattice parameters and the TO mode frequency are completely different.

7. It was argued in 9 that the TO mode cannot couple noticeably to the TA branch because the independent mode intensities do not change with temperature. However, this not a valid argument since the measurements shown in figure of Ref. 9 were done in (20q) zone, where both TA and TO modes have similar structure factors so that eventual eigenvector change has no chance to produce such drastic intensity changes as those observed in the quoted 9 case of $SrTiO_3$.