

Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Critical

Slowing Down in the Relaxor Ferroelectric $K_{1-x}Li_xTaO_3$ (KLT) LING CAI, JEAN TOULOUSE, Lehigh University, Physics Department — In this report, we illustrate an essential characteristic of mixed crystals such as KLT: the strong dependence of their macroscopic properties on the spatial distribution of the mixed ions in the crystal. As a prototypical relaxor ferroelectric, KLT exhibits a large dielectric constant, low frequency dispersion and a broad relaxation peak. Lithium randomly substitutes for potassium and, because of its smaller size, moves off-center in one of six possible $\langle 100 \rangle$ directions thus forming a local dipole. Correlations between these dipoles lead to the appearance of Polar Nanodomains (PNDs), the size and polarization of which depend on local density fluctuations or type of distribution of the Li ions (random homogeneous or locally clustered). The dielectric constant of two KLT crystals with almost identical average Li concentrations displays two radically different behaviors, which can be traced to two very different distributions of the lithium ions in the two crystals. This is particularly striking of the critical behaviors in the two separate crystals. A first order structural transition is observed in one crystal but critical slowing down is observed in the other. The type of spatial distribution present in each crystal can be inferred from the dielectric results.

Ling Cai
Lehigh University, Physics Department

Date submitted: 11 Nov 2011

Electronic form version 1.4