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Fluctuating defects in the incipient relaxor $\mathbf{K_{1-x}Li_xTaO_3}$ (x = 0.02) PETER GEHRING, NIST - Natl Inst of Stds & Tech, CHRIS STOCK, University of Edinburgh, GUANGYONG XU, Brookhaven National Lab, DANIEL LAMAGO, Karlsruher Institut fur Techologie, DMITRY REZNIK, University of Colorado, MARGARITA RUSSINA, Helmholtz Zentrum Berlin, JINSHENG WEN, Nanjing University, LYNN BOATNER, Oak Ridge National Lab — We have measured the structural correlations associated with the apparent relaxor transition near 70 K in $K_{0.98}Li_{0.02}TaO_3$ (KLT(0.02)) with neutrons. No elastic diffuse scattering or soft mode anomaly is observed, a situation that diverges from that in other relaxors like PMN. The structural correlations in KLT(0.02) are dynamic at all temperatures with timescales of $\sim$ THz. The fluctuations are overdamped, non-propagating, spatially uncorrelated, and absent in the parent material $KTaO_3$. The temperature dependence correlates with the dielectric response, implying that the fluctuations are associated with local, ferroelectric regions induced by the Li-doping. The ferroelectric transition induced by the introduction of sufficient Li cations is thus characterized by quasistatic fluctuations, which is a stark contrast to the soft-harmonic-mode-driven transition observed in perovskite ferroelectrics like $PbTiO_3$. The glass-like structural correlations in KLT(0.02) are much faster than those in random-field, lead-based relaxors, which occur on the $\sim$ GHz timescale, and they are better correlated spatially. Our results support the view that random fields give rise to the relaxor phenomena, and that the glassy dynamics observed here represent a nascent response.

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