

Microsymposium

MS55.O03

Local Symmetry Breaking in the High Temperature Regime of SnTe

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The term *emphanisis* [1] has been coined to define the appearance of local off-centering displacements of ions from a high-symmetry ground state on warming, as recently discovered in PbTe [2]. Such a phenomenon is unusual because, in the canonical view of structural transformations, a low-symmetry ground state evolves into a higher symmetry state on warming. Although it is not uncommon for remnants of a low-symmetry phase to appear as spatial fluctuations at high temperature, the emergence of a locally broken symmetry state from a high symmetry ground state is quite rare. *Emphanisis* may be behind some long-known, but poorly understood anomalies seen in the lead chalcogenides. However, the origin and nature of *emphanisis* are still the subject of controversy. Several explanations for *emphanisis* have been suggested, including a simple response to an underlying anharmonic potential [3], a dynamic ferroelectric-like off-centering [2], and a temperature-dependent competition between ionicity and covalency [1], but an understanding remains elusive. In this talk I will report on atomic pair distribution function (PDF) measurements of the lead-free compound SnTe, which is isostructural to PbTe at high T but with a ferroelectric phase below $T_c \sim 100\text{K}$. Our data show that SnTe also exhibits an *emphanitic* response, but with an onset temperature well above T_c and a symmetry that is distinct from that of the ferroelectric phase. Taken together these results suggests that the *emphanitic* and ferroelectric responses are quite distinct.

[1] K. R. Knox, E. S. Bozin, C. D. Malliakas, et al, *Phys. Rev. B* 89, 014102 (2014)., [2] E. S. Bozin, C. D. Malliakas, P. Souvatzis, et al, *Science* 330, 1660 (2010)., [3] O. Delaire, J. Ma, K. Marty, A. F. May, et al, *Nature Mater.* 10, 614 (2011).

Keywords: PDF, Symmetry breaking, SnTe