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Visualizing the Short-Range Magnetic Correlations in the Technologically Relevant Semiconductor MnTe RAJU BARAL, BENJAMIN FRANDSEN, Brigham Young University — The antiferromagnetic semiconductor MnTe has recently attracted significant attention as both a high-performance thermoelectric and as a candidate material for spintronics. The magnetic properties of MnTe play a crucial role in both of these possible applications. MnTe has a hexagonal layered structure in which magnetic Mn^{2+} ions order ferromagnetically within the plane and antiferromagnetically between the planes below $T_N = 307$ K. Above T_N, robust short-range magnetic correlations known as paramagnons survive to high temperature. It has been suggested that these paramagnons are responsible for the high thermoelectric figure of merit zT in Na-doped MnTe at high temperature. Here, we present comprehensive atomic and magnetic pair distribution function (PDF) analysis of neutron total scattering data collected from pure and Na-doped MnTe in the temperature range of 100 K – 500 K, allowing us to track in detail the evolution of the magnetic correlations from the long-range ordered state at low temperature to the short-range ordered paramagnon state at high temperature. The companion data sets for the pure and doped samples also highlight important differences in the magnetic structure between the two samples. We present real-space magnetic models that reproduce the observed mPDF pattern with quantitative accuracy and discuss the significance of these results in the context of existing work on MnTe.

Raju Baral
Brigham Young University

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