



Atomically sharp domain walls in an antiferromagnet

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Abstract:

Antiferromagnetic materials have recently seen a significant increase in research efforts, due to their potential applications in electrical and ultra-fast optical devices. Here, we focus on tetragonal CuMnAs, which has shown a great promise within these fields. Characterization of high crystal quality CuMnAs grown by molecular beam epitaxy has unveiled presence of magnetic textures with dimensions below the detection methods of typically implemented microscopy techniques. We show that qualitative analysis of 4-D and differential phase contrast scanning transmission microscopy data acquired on CuMnAs, can be used to image the local magnetic ordering in the material. Using this technique, we identify abrupt domain walls in the CuMnAs thin films, which correspond to the Néel order reversal between two neighboring crystal planes. Finally, we relate the magnetic nanotexturing of CuMnAs to physical mechanisms governing the recently discovered quenching of CuMnAs into high resistivity states.