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Cross-sectional scanning tunneling microscopy of $\text{Ga}_{1-x}\text{Mn}_x\text{As}/\text{GaAs}$ Heterostructures¹ PEDRAM ROUSHAN, ANTHONY RICHARDELLA, Department of Physics, Princeton University, SHAWN MACK, DAVID AWSCHALOM, Center for Spintronics and Quantum Computation, University of California, Santa Barbara, ALI YAZDANI, Department of Physics, Princeton University — We have used a cryogenic scanning tunneling microscope (STM) to perform cross-sectional imaging studies of GaMnAs heterostructures. The heterostructures, consisting of a p-type buffer followed by a 3% Mn doped layer, were grown on a n-type GaAs substrate by molecular-beam epitaxy and cleaved in situ for STM measurements. The topographic measurements on the GaMnAs layer showed a variety of long range electronic structure modulations on the order of a few nm due to high level of disorder and compensation. Combining bias-dependent imaging and spectroscopy, we have used the STM to identify electronic features due to Mn dopants and other defects. In particular, we find that Mn dopants on the top most layer act as deep acceptors and exhibits similar topographic and spectroscopic features as our previous work [1] on Mn adatoms substituted into GaAs using STM manipulation techniques. [1] D. Kitchen, A. Richardella, J-M. Tang, M. Flatte, A. Yazdani, Nature 442, 436–439 (2006)

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