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Low moment ferrimagnetism in Mn_3Al as probed by Polarized Neutron Reflectometry[1] MICHELLE JAMER, NIST - Natl Inst of Stds Tech , YUNG-JUI WANG, Northeastern University, JULIE BORCHERS, BRIAN KIRBY, NIST - Natl Inst of Stds Tech, BERNARDO BARBIELLINI, ARUN BANSIL, DON HEIMAN, Northeastern University — For future spintronic devices, it is paramount to limit stray magnetic interactions which can negatively impact spin injection. A new class of materials called half-metallic antiferromagnets or compensated ferrimagnets have been proposed to remedy this problem. In this work, Mn_3Al thin films have shown promising room temperature low-moment ferrimagnetic magnetic properties. Epitaxial Mn_3Al thin films (50 nm) were grown on desorbed GaAs(001) substrates via MBE at 200 ^{o}C and annealed further to temperatures between 250 - 350 ^{o}C. The $D0_3$ Heusler-type phase was determined by X-ray diffraction with texturing in the [311] direction. Density functional theory, performed using VASP, indicated that the crystallographic structure of Mn_3Al is able to form energetically with a low magnetic moment (0.017 μ_B/f.u.) despite some epitaxial distortion. SQUID magnetometry confirmed the low magnetic moment and high Curie temperature (610 K) of the structure. Polarized Neutron Reflectometry was used to determine the effect of epitaxy on the magnetic moment of Mn_3Al, and analysis confirms a low magnetic moment (0.11 μ_B/f.u.) for the samples annealed at temperatures between 200-300 ^{o}C. This analysis further suggests that the relaxation of the Mn_3Al at the interface.

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