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In-plane uniaxial anistropy in epitaxial InMnAs on GaSb determined using the magneto-optical Kerr effect PHILIP CHIU, Northwestern University, STEVEN MAY, BRUCE WESSELS — The in-plane magnetic anisotropy of (001) oriented InMnAs/GaSb layers grown by metal organic vapor phase epitaxy was investigated by the longitudinal magneto-optic Kerr effect. The films exhibited ferromagnetic hysteresis at room temperature. An $In_{0.96}Mn_{0.04}As$ film with a thickness of 50 nm was tetragonal and coherently strained to the GaSb substrate. The c-axis lattice constant was 1.008 times smaller than that of GaSb, in agreement with elasticity theory. These films exhibit uniaxial in-plane anisotropy with the easy axis of magnetization along the [110] direction. Along the easy axis, a square hysteresis loop was obtained with a coercive field of 990 Gauss. In contrast, an $In_{0.93}Mn_{0.07}As$ film with a thickness of 320 nm was incoherent. The c-axis lattice constant matched that of bulk $In_{0.93}Mn_{0.07}As$. The shape of the hysteresis loops for the fully relaxed film was invariant with respect to in-plane rotation. The coercive field for the unstrained InMnAs film was 280 Gauss. The large difference in coercive fields between the two samples is attributed to the disparity in the uniaxial anisotropy constant (K_u). In addition, the observation of uniaxial anisotropy for only coherently strained films indicates that the anisotropy is due to the twofold symmetry of a zinc-blende (001) substrate surface. These results are consistent with a previous study of magnetic anisotropy of InMnAs epitaxial films grown on InAs and GaAs (001) substrates.(Chiu APL 2004)

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