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Magnetic anisotropy of (Ga,Mn)As formed by Mn ion implantation and pulsed-laser melting Y. J. CHO, Z. GE, Y. Y. ZHOU, X. LIU, M. DOBROWOLSKA, J. K. FURDYNA, Department of Physics, University of Notre Dame, Notre Dame, IN 46556, M. A. SCARPULLA, O. D. DUBON, Lawrence Berkeley National Laboratory, Berkeley, CA 94720 — We report on the magnetic anisotropy of (Ga,Mn)As formed by Mn ion implantation followed by pulsed-laser melting. Three specimens with different Mn doses have been systematically studied by SQUID magnetometry, magnetotransport and ferromagnetic resonance. The sample corresponding to the lowest Mn dose does not show any measurable magnetic anisotropy. With increasing Mn doses, however, complex magnetic anisotropy behavior clearly emerges. In particular, the high-Mn-dose samples show unambiguous in-plane uniaxial and cubic anisotropy, similar to that observed in (Ga,Mn)As layers grown by LT-MBE. As these samples were produced by a different processing method, this result lends credence to the hypothesis that the in-plane cubic symmetry breaking is intrinsic to the dilute (Ga,Mn)As phase. Furthermore, in contrast to LT-MBE grown (Ga,Mn)As, these specimens show small perpendicular uniaxial anisotropy, which can be interpreted by a small built-in compressive strain due to the absence of Mn interstitials characteristic of these specimens. Finally, we also observe that a super-paramagnetic phase with distinct perpendicular magnetic anisotropy exists in these specimens. An investigation into the origin of this second magnetic phase is in progress.

Xinyu Liu
University of Notre Dame

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