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Interfacial exchange coupling in Fe/(Ga,Mn)As bilayers ABDEL KHALQ ALSMADI, Kuwait Univ, Y. CHOI, D.J. KEAVNEY, Argonne National Lab., K.F. EID, Miami Univ., B.J. KIRBY, National Institute for Standard Technology, X. LIU, J. LEINER, Univ. of Notre Dame, K. TIVAKORNSASITHORN, Mahidol University, M. DOBROWOLSKA, J.K. FURDYNA, Univ. of Notre Dame — We have carried out a systematic studies of magnetic order and coupling in Fe/(Ga,Mn)As bilayers using superconducting quantum interference device magnetometry, polarized neutron reflectometry, x-ray absorption spectroscopy, and x-ray magnetic circular dichroism. Our results clearly show that Fe/(Ga,Mn)As bilayers display exchange coupling at the interface. Contrary to recent reports [e.g., F. Maccherozzi et al., Phys. Rev. Lett. 101, 267201 (2008)], a ferromagnetic coupling between the magnetic moment of the Mn ions and the moment of the Fe overlayer is observed. Furthermore, our element-specific data indicate that an ultrathin Mn-rich interfacial (Ga,Mn)As layer directly in contact with the Fe film is strongly coupled to the Fe layer, showing nearly identical coercive fields as the Fe layer, while the coercive fields of the bulk (Ga,Mn)As further from the Fe layer are distinctly weaker. We argue that the exchange coupling strength between Fe and Mn at the interface and throughout the (Ga,Mn)As layer is a function of the Mn concentration in the system, possibly arising from the diffusion of Mn interstitials during the MBE growth.

Abdel Khalq Alsmadi
Kuwait Univ

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