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Spin-engineered hybrid ferromagnet/semiconductor nanowires J. LIANG, B.J. COOLEY, N. DELLAS, D. RENCH, D.M. ZHANG, A. KANDALA, P. SCHIFFER, S.E. MOHNEY, N. SAMARTH, Center for Nanoscale Science and Materials Research Institute, Penn State University, University Park PA 16802, B. MAERTZ, D.D. AWSCHALOM, Center for Spintronics and Quantum Computation, University of California, Santa Barbara CA 93106 — Hybrid ferromagnet/semiconductor (NWs) provide new opportunities for nanospintronics by integrating heterogeneous materials in the form of axial and radial heterostructures [e.g. APL **95**, 133126 (2009)]. Here, we report structural, magnetic and opto-electronic investigations of hybrid ferromagnet/semiconductor NWs synthesized by the molecular beam epitaxy of MnAs on the facets of zinc-blende GaAs NWs. The latter are grown *in situ* by a self-seeded process on (111)B GaAs substrates. Transmission electron microscopy reveals the epitaxy of a single crystal MnAs shell on a GaAs NW core. Raman and photoluminescence spectroscopies probe changes in the vibrational and emission spectra of single GaAs NWs imposed by the growth of the MnAs shell. Magnetic force microscopy confirms the presence of ferromagnetism at room temperature. We develop novel approaches to probe the dynamical magnetic response of a single NW using vector magnetometry. Work supported by NSF and ONR.

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