Abstract Submitted
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Controlling ferromagnetism in GaMnAs by arsenic defect engineering[1] R. C. MYERS, A. W. JACKSON, A. C. GOSSARD, D. D. AWSCHALOM, Center for Spintronics and Quantum Computation, University of California, Santa Barbara, CA 93106, B. L. SHEU, P. SCHIFFER, N. SAMARTH, Department of Physics, The Pennsylvania State University, University Park, PA 16802 — We manipulate the Curie temperature and hole density of $Ga_{1-x}Mn_xAs$ for $x = 0.75\%$ to 3% by systematically varying the arsenic compensation by As-flux control. The As:Ga flux ratio is varied using a new technique of non-rotated GaMnAs growth, where the geometry of the molecular beam epitaxy system provides a continuous variation in As-flux across a wafer. In this manner, As-stoichiometry can be calibrated in a single growth run for any Mn doping density. The hole density and Curie temperature are maximized at the same position on each wafer suggesting that minimizing As-defect compensation improves magnetic properties. Surprisingly, changes in the arsenic flux of as little as 10% can quench ferromagnetism in the low Mn-doped material causing an apparent shift in the paramagnetic to ferromagnetic cross over transition toward higher Mn concentrations. The results suggest that proper control of arsenic compensation is critical for optimizing Curie temperatures in the low Mn-doping regime.

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