Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Semiconductor Hall magnetometers for magnetic measurement of (In,Cr)As quantum dots[1] JOON-IL KIM, T. GUAN, S. VON MOLNAR, P. XIONG, Florida State University, S.L. WANG, H.L. WANG, J.H. ZHAO, Institute of Semiconductors, CAS — Recently, SQUID magnetometry measurements of MBE-grown self-assembled (In,Cr)As QDs showed magnetic hysteresis indicating possible existence of ferromagnetic ordering above 300 K [1]. However, the temperature dependence of the remnant magnetization did not follow the standard Brillouin-like behavior, and the interpretation of the data and elucidation of the origin of the ferromagnetism in the QDs have been hindered by the large ensemble-averaged measurement. Measurements on small clusters or even individual QDs would facilitate a direct correlation of the measured magnetic properties with their structural and chemical characteristics, possibly enabling a definitive understanding of the origin of the ferromagnetism in the diluted magnetic semiconductor QDs. Towards this goal, we have fabricated integrated micro-Hall magnetometers based on high-mobility GaAs/AlGaAs 2DEG in order to facilitate static and dynamic magnetic measurements of the QDs via the Hall gradiometry technique. Integrated structures of (In,Cr)As QDs on top of a GaAs/AlGaAs heterostructure were grown entirely in situ by MBE. Micro-Hall magnetometer devices with six Hall-crosses were fabricated using photolithography and wet chemical etching. Using carefully calibrated selective chemical etching, all QDs were removed except those on three of the Hall-crosses so as to enable gradiometry measurement. Results of on-going measurements will be discussed.

[1] H. J. Meng et al., Euro. Phys. Lett. 84, 58007 (2008).

[1]Work supported by NSF grants DMR-09008625 and DMR-1308613.

Joon-Il Kim
Florida State University

Date submitted: 16 Nov 2013 Electronic form version 1.4