Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Electrical spin injection into the ground and excited states of uniform InAs quantum dots[1] M. YASAR, I. KHAN, M. DIAZ-AVILA, A. PETROU, SUNY at Buffalo, G. KIOSEOGLOU, C.H. LI, B.T. JONKER, Naval Research Laboratory — Spin-polarized electrons from Fe contacts were injected into zero-dimensional InAs quantum dots (QDs) where they recombine with unpolarized holes. Using standard MBE growth techniques, the QD density was reduced resulting in uniform dot-size distribution. In these new samples the broad electroluminescence (EL) observed previously in the high QD density LEDs is replaced by distinct features associated with the atomic-like s-, p-, d-, and f-shells of the QDs. As the diode bias voltage was increased, higher energy shells became populated. The circular polarization of these features was studied as function of applied magnetic field, bias, and temperature. Significant differences were observed in the behavior of the various EL features. The polarization dependence on magnetic field confirms spin injection from Fe. Furthermore, higher energy shells exhibit correspondingly higher polarization values consistent with optical pumping studies.

[1]Work at SUNY was supported by ONR (N000140610174) and NSF (ECS0524403).

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Date submitted: 02 Dec 2006 Electronic form version 1.4