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Spin Injection from Fe and FeGa into side-emitting GaAs spin LEDs G. KIOSEOGLOU, O.M.J VAN 'T ERVE, A.T. HANBICKI, C.H. LI, B.T. JONKER, Naval Research Laboratory, Washington DC — Most of the spin LEDs used as spin detectors are of the surface type. In this type of LEDs, using Fe as spin polarized source, electron spin polarizations up to 40 % have been reported. Since Fe has its magnetization easy axis in the substrate plane, a large magnetic field B (2.5 tesla) along the surface normal is required to saturate the magnetization. A side-emission geometry, on the other hand, enables magnetic switching fields of $\sim$ 100 Oe, a much more practical range for applications. We present a study of electrical spin injection from Fe and FeGa into side-emitting GaAs spin LEDs in which the applied magnetic field is parallel to electroluminescence emitted from the cleaved side. Several samples with different quantum well (QW) widths were investigated. The optical polarization for the 100Å QW spin LED is zero, as expected due to hole spin orientation. For wider QWs, the confinement energy diminishes and the magnetic field rather than the confinement defines the quantization axis. An optical circular polarization P = 6 % is measured for the 1000 Å QW LED which corresponds to an electron spin polarization of 12 %. The non-volatile character of the side-emitting spin LED will be also discussed using FeGa as a spin injector. This work was supported by DARPA and ONR.

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