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Electrical injection and detection of spin-polarized carriers in silicon in a lateral transport geometry OLAF VAN 'T ERVE, AUBREY HANBICKI, MICHAEL HOLUB, CONNIE LI, CHAFFRA AWO-AFFOUDA, PHILIP THOMPSON, BEREND JONKER, Naval Research Laboratory — Significant progress has recently been made on spin injection into the technologically important semiconductor, Si, using vertical device structures. [1,2] We present the electrical injection, detection and magnetic field modulation of lateral diffusive spin transport through silicon using surface contacts. Fe/Al2O3 tunnel barrier contacts are used to create and analyze the flow of pure spin current in a silicon transport channel. Non-local detection techniques show that the spin current detected after transport through the silicon is sensitive to the relative orientation of the magnetization of the injecting and detecting contacts. Hanle effect measurements demonstrate that the spin current can be modulated by a perpendicular magnetic field, which causes the spin to precess and dephase in the transport channel. The realization of efficient electrical injection and detection using a tunnel barriers and a simple device geometry compatible with "back-end" Si processing should greatly facilitate development of Si-based spintronics. This work was supported by ONR and core NRL programs. 1. Jonker et. al., Nat. Phys. 3, 542 (2007) 2. Applebaum et. al., Nat. 447, 295 (2007)

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