Silicon Spintronics

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Spin-based semiconductor integrated circuits will require long spin lifetimes to enable multiple logic operations before depolarization and decoherence sets in. In addition, long spin transport lengths are needed to enable integration of multiple devices in a circuit. Silicon has been broadly viewed as the ideal material for spintronics due to its low atomic weight, lattice inversion symmetry, and near lack of nuclear spin, resulting in exceptionally long spin lifetime. Despite this appeal, however, the experimental difficulties of achieving coherent spin transport in silicon were overcome for the first time only recently (at Delaware), by using unique spin-polarized hot-electron injection and detection techniques.[1] I will present our solution to this long-standing problem, including observations of very long spin lifetimes and transit lengths,[2] and its impact on prospects for Silicon spintronics as the basis for a new paradigm of information processing.

[1] Ian Appelbaum, Biqin Huang, and Douwe J. Monsma, "Electronic measurement and control of spin transport in silicon", Nature **447**, 295 (2007)

[2] Biqin Huang, Douwe J. Monsma, and Ian Appelbaum, "Coherent spin transport through a 350-micron-thick silicon wafer", Phys. Rev. Lett. **99**, 177209 (2007)