Si Platform for Implementing Spin-based Quantum Computing

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Application of elelctron (or hole) spins confined into Si quantum dots for implementing quantum computing is receiving increased attention because of various advantages such as long decoherence time ($\lesssim$ msec), small physical area per qubit ($\leqslant 0.1$ μm^2), high temperature operation ($\gtrsim$ K), and compatiblity with industrial technology. Indeed various techniques have been developed for manipulating spins, including operation of single and two-qubit gates with high fidelity and above 1.5 K and fabrication of CMOS based qubit devices. In this talk I will first review recent advances in embodying the advantages of Si devices with Si/SiGe and Si-MOS as platforms, and then discuss technical development to implement fault tolerant computation, including high-fidelity gate operations of one to three qubits. I will finally review recent efforts to scale up the qubit system based on the industrial technology.