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Electrical spin injection and detection in Si nanowires with axial doping gradient KONSTANTINOS KOUNTOURIOTIS, JORGE BARREDA, TIM KEIPER, MEI ZHANG, PENG XIONG, Florida State Univ — Due to the technological importance and potential long spin coherence time in silicon, there have been significant recent efforts to realize spin injection, coherent transport, and electrical spin detection in Si nanowires (NWs). The nature of the electronic transport at the interface and its resistance are crucial factors in realizing efficient spin injection/detection between a ferromagnet (FM) and a semiconductor (SC). In this work, we examine the effects on electrical spin injection and detection by FM/SC interfaces with well-defined Schottky barriers in Si NW devices. The Si NWs are synthesized via a vapor-liquid-solid method using silane and phosphine precursor gases for the growth and doping respectively, which results in a graded phosphorus doping profile along the length of the NW. The Si NWs are dispersed on a p^+-$Si/SiO_2/SiN_x$ substrate, and a series of CoFe electrodes are defined along a Si NW with electron beam lithography and magnetron sputtering after the removal of the native oxide by HF treatment. As a consequence of the doping gradient, the FM electrodes form Ohmic and Schottky barrier contacts of varying heights along the length of a single NW. Two-terminal local and four-terminal non-local spin-valve measurements are performed to probe spin accumulation and transport at different FM contacts, enabling a study of the dependence of the spin signals on the Schottky barrier height and interface resistance on a single device. *Work supported by NSF grant DMR-1308613.

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