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Electric Characterization of $FeSi_2$ Nanowires by Conductive-AFM SHENGDE LIANG, Arizona State University — Since continuing miniaturization of silicon electronics encounters the limits of lithography, silicide nanowires are proposed to act as both devices and the wires that access them in bottom-up fabrication scheme. Iron silicides nanowires can be metallic, magnetic and semiconducting depending on different phases it takes, which make it promising for nanodevices design. Here we characterized Schottky Barrier Height (SBH) of iron silicide nanowires on n-type silicon, which is not uniform ranging from 0.35 to 0.8eV with diamond coated tips. To measure electric transport properties within a single nanowire, we deposited a gold pad to partially cover one nanowire, and use diamond coated tip as another terminal. Nanowires with dimension of 5nm high by 10nm wide by several micrometer long have resistance about 20k ohm at room temperature, this is about 4 times larger than bulk iron silicide resistivity. We tried different metals coated tips and tips with different force constants. Diamond coated tips are most wear-resistant, but have highest contact resistance, which is estimated to be 20k ohm. Other metal coated tips, such as PtIr, PtCr coated tips, have lower contact resistance, less than 1k ohm, but these tips apex are easily scanned off. Suitable contact force were also calibrated to be around 200nN, too strong force will damage nanowire and tip coating layer, while too weak contact lead to high contact resistance.

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