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Tunneling Characteristics across Nano-Scale Metal Ferric Junction Lines into Doped Si[1] JIAN-QING WANG, KEQIANG WANG, JIRI STEHLIK, Binghamton University — Tunneling properties were studied on nanofabricated metal ferric tunnel structures on phosphorus doped silicon by measuring $I-V$ characteristics and differential conductance versus bias over a wide temperature range between 80 K to 325 K. These properties were found to have very weak temperature dependences up to 250 K. Such temperature independencies in transport properties demonstrated tunneling characteristics from metal ferric nano-lines into Si via AlO_x insulating barrier. Nanoscaled spin-dependent tunneling (STD) lines were patterned on doped Si with the injection contacts having the form of long strips with width and separation of 100 nm and several micron long patterned by e-beam lithography. The measured tunneling coefficient was nearly independent of the bias below 1.0 V, and abruptly increases above the threshold, indentifying such threshold as tunneling barrier height. The thermal transport of the active Si region demonstrated a direct correlation between thermal activation of deep levels (of 0.4 eV) in bulk Si and metal-semiconductor tunneling, revealing feasible mechanisms influencing the interfacial transport.

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