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Hot-Electron Spin-Transport Through Tantalum Films and Interfaces HUSEYIN GOKCAN, RONALD JANSEN, COCK LODDER, MESA+ Institute for Nanotechnology, University of Twente, The Netherlands — The spin-valve transistor (SVT) is a hybrid semiconductor/ferromagnet device based on the spin-dependent transmission of hot electrons across a metallic spin-valve sandwiched between a semiconductor emitter and collector. The transistors have the configuration Si / NM / FM / NM / FM / NM / Si and contain ferromagnetic (FM) materials such as Co, NiFe, and various non-magnetic (NM) materials in the spin-valve base. SVT's with 7 nm Au as the NM spacer exhibit a magnetocurrent (MC) of 350%. Interestingly, we find a sharp drop of the MC to only 9% when Au is replaced by 6 nm Ta as the spacer. We also find that Ta has a short hot-electron attenuation length of about 1.5 nm, attributed to the existence of partially empty d-bands. The strong reduction in MC for SVT's with Ta spacer is surprising, since it is known that the large MC in the SVT results from the spin-dependence of the bulk attenuation lengths for majority and minority spins in ferromagnets. We consider spin-dependent scattering at the Ta/FM interfaces and a short spin relaxation time in bulk Ta as possible reasons.

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