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Iterative and self-consistent quantification of nonlocal spin valves with low-resistance oxide barriers YUNJIAO CAI, Department of Physics and Astronomy, University of Delaware, YONGMING LUO, CHAO ZHOU, Department of Physics, Fudan University, CHUAN QIN, SHUHAN CHEN, Department of Physics and Astronomy, University of Delaware, YIZHENG WU, Department of Physics, Fudan University, YI JI, Department of Physics and Astronomy, University of Delaware — The standard method of quantifying nonlocal spin valves is to assume an exponential decay of the spin signal as a function of the channel length. Then the spin diffusion length and the spin polarization can be extracted via fitting. However, this method does not distinguish between the injection polarization and the detection polarization. In addition, the assumption that the channel length is the only varying parameter may not be always valid. In this work, a large number (>50) of Py-AlOx-Cu NLSV structures on a single substrate are investigated. The standard fitting of exponential decay is initially performed but appears unsatisfactory. We then assume an additional dependence of the spin polarization on the size of the Py/AlOx/Cu junctions, and normalize the spin signals by using the actual junction sizes in individual structures. By feeding the parameters iteratively, we are able to collapse all normalized spin signals on an exponential decay curve with good correlation. The injection/detection polarization strongly depends on the size of the Py/AlOx/Cu junctions. The coexistence of large Cu resistivity and long spin diffusion length points to interesting mechanism of spin relaxation.

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