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Spin Hall effects from mesoscopic Pt films with high resistivity CHUAN QIN, Department of Physics and Astronomy, University of Delaware, YONGMING LUO, CHAO ZHOU, Department of Physics, Fudan University, YUNJIAO CAI, 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 spin Hall effect (SHE) and inverse spin Hall effect (ISHE) are explored in mesoscopic lateral structures. Each structure consists of a Pt stripe, a Cu channel and a Py spin injector/detector. Low-resistance AlOx layers are placed at all interfaces. Two groups of structures are made with different sizes of the Pt/AlOx/Cu interfaces. The average resistance values of interfaces are 80 ohm in one group and 4 ohm in the other. Despite the resistance difference by a factor of 20, the average SHE signals only differ by a factor of 1.8 with the low-resistance structures showing higher signals. For a low-resistance interface, the ISHE signal is enhanced due to a more efficient absorption of the pure spin current but at the same time the signal reduction due to current shunting is also more severe. We are able to estimate the effect of shunting and the rate of spin absorption and obtain the product of spin Hall angle and the Pt spin diffusion length. It is noteworthy that the resistivity of the Pt stripe is substantially larger than that of an extended film. The large Pt resistivity contributes positively to the size of the signals but also implies short Pt spin diffusion length ($<$2nm). A sizable Pt spin Hall angle of $>$0.09 is estimated.

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