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Extrinsic Spin Hall Effect Induced by Resonant Skew Scattering in Graphene[1] AIRES FERREIRA[2], Graphene Research Centre and Department of Physics, National University of Singapore, 2 Science Drive 3, Singapore 117546, Singapore, TATIANA G. RAPPOPORT, Instituto de Fiisica, Universidade Federal do Rio de Janeiro, CP 68.528, 21941-972 Rio de Janeiro, RJ, Brazil, MIGUEL A. CAZALILLA, Department of Physics, National Tsing Hua University, and National Center for Theoretical Sciences (NCTS), Hsinchu City, Taiwan, A.H. CASTRO NETO, Graphene Research Centre and Department of Physics, National University of Singapore, 2 Science Drive 3, Singapore 117546, Singapore — We show that the extrinsic spin Hall effect can be engineered in monolayer graphene by decoration with small doses of adatoms, molecules, or nanoparticles originating local spin-orbit perturbations. The analysis of the single impurity scattering problem shows that intrinsic and Rashba spin-orbit local couplings enhance the spin Hall effect via skew scattering of charge carriers in the resonant regime. The solution of the transport equations for a random ensemble of spin-orbit impurities reveals that giant spin Hall currents are within the reach of the current state of the art in device fabrication. The spin Hall effect is robust with respect to thermal fluctuations and disorder averaging.

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