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Direct observation of spin-to-charge conversion in MoS2 monolayer with spin pumping CHENG CHENG, VIKTORIA IVANOVSKAYA, JUAN-CARLOS ROJAS SANCHEZ, BRUNO DLUBAK, PIERRE SENEOR, Unité Mixte de Physique CNRS/Thales and Université Paris Sud, YOUNG HEE LEE, GANGHEE HAN, CINAP Institute for Basic Science; Department of Energy Science, Sungkyunkwan University, HYUN KIM, CINAP Institute for Basic Science, Sungkyunkwan University, HEEJUN YANG, CINAP Institute for Basic Science; Department of Energy Science, Sungkyunkwan University, ABDELMADJID ANANE, Unité Mixte de Physique CNRS/Thales and Université Paris Sud — Unlike graphene, layered transition-metal dichalcogenides are 2D wide bandgap semiconductors with large intrinsic spin-orbit coupling (SOC) and valley-spin coupling, which makes them a unique playground for spintronics. We present here the first demonstration of spin injection into monolayer MoS2 with spin pumping from a 3D ferromagnetic (FM) film, circumventing the impedance mismatch at the metal-semiconductor interface. We measured the transverse voltage generated by spin-to-charge current conversion in MoS2 with broadband (3 GHz- 9 GHz) ferromagnetic resonance (FMR) setup. The observed symmetric Lorentzian signals are in 1μV range under small rf excitations well below 1 Oe. This voltage magnitude is unexpected for inverse spin Hall effect and is interpreted in the frame of inverse Rashba-Edelstein effect (iREE) due to strong SOC in MoS2. By applying a moderate gate voltage (up to 10 V) on the MoS2/FM multilayer, we observe clear modulation (up to 30%) of the linewidth and amplitude of the iREE signal, indicating electrical tuning of the spin mixing conductance.

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