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Abstract for an Invited Paper
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Spin Hall effect and spin transport in graphene and 2D heterostructures

BARBAROS OEZYILMAZ[1], National University of Singapore

Semiconducting 2D materials offer new opportunities in both alternative technologies and fundamental discoveries by using the spin degree freedom of electrons. One of the main challenges in this field is to identify new materials which allow the control of spin currents by means of the electric field effect. This requires either a sizeable spin-orbit coupling strength or a sizeable bandgap or both. Unfortunately, pristine graphene has a negligibly small spin-orbit coupling strength. Recently we have addressed this problem in three distinct ways. First we have used chemical functionalization to introduce locally sp3 type bonding. Next we used metal ad-atoms to increase spin-orbit coupling via local enhancement of the spin-orbit coupling strength due to resonant scattering. Finally, I will show that the proximity of graphene on transition metal dichalcogenides can also lead to a significant enhancement of the spin-orbit coupling strength. I will complete my talk with a brief discussion on the possibility of all electrical spin injection into complementary 2D crystals such as WS2, MoS2 or black phosphorus.

[1]Membership Pending in the abstract Special Instructions field