

Spin Currents with Antiferromagnets

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Metallic antiferromagnets have generated a wide range of interest recently, since they can exhibit a complex interplay between charge transport and magnetic structure [1,2]. In this presentation I will highlight some of our own recent work that explores the interplay between magnetic structure and spin transport. First, I will discuss, how magnetic field induced changes of the antiferromagnetic magnetic structure can result in interfacial unidirectional magnetoresistance [3]. Here the coupling of the induced net magnetization in the antiferromagnet to interfacial Rashba-type spin-orbit coupling leads to a characteristic field dependence of the magnetoresistance, which changes sign at relatively large magnetic fields. Furthermore, I will discuss how the antiferromagnetic spin structures can give rise to additional symmetry breaking, which in turn enables the generation of spin currents with novel geometries. Towards this end, we detected the magnetic spin Hall effects in IrMn₃ via the spin-orbit torques exerted on an adjacent ferromagnetic layer [4]. Additionally, we explored spin-orbit torques in FeRh and discovered that in the antiferromagnetic state FeRh exhibits unusually strong spin-orbit torques with exotic symmetries [5]. Lastly, I will discuss, how the novel spin-orbit torques from antiferromagnets may in turn be used for driving new magnetization dynamics [6].

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