POSTER

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Topic: Spin-Orbit Coupling Effects in First-Principles Quantum Transport

Title: Spin Hall and Edelstein effects in metallic films: From two to three dimensions

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Summary:

A normal metallic film sandwiched between two insulators may have strong spin-orbit coupling near the metal-insulator interfaces, even if spin-orbit coupling is negligible in the bulk of the film. We study two deeply interconnected effects that arise from interfacial spin-orbit coupling in metallic films. The first is the spin Hall effect, and the second is the Edelstein effect. At variance with strictly twodimensional Rashba systems, we find that the spin Hall conductivity has a finite value even if spin-orbit interaction with impurities is neglected and ”vertex corrections” are properly taken into account. Even more remarkably, such finite value becomes ”universal” in a certain configuration. This is a direct consequence of the spatial dependence of spin-orbit coupling on the third dimension, perpendicular to the film plane. Our results, although derived in a specific model, should be valid rather generally, whenever a spatially dependent Rashba spin-orbit coupling is present.