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Advances in the theory and experiments of spin spectroscopy in solids

Spin spectroscopy is an additional tool to study spin-transport in metals and semiconductors beside non-local resistance, Hanle spin-precession, and optical polarization methods. I review the experimental situation on spin-spectroscopic (i.e. conventional electron spin resonance) studies in novel materials including MgB2 (Ref. 1), superconducting fullerides (Ref. 2) and graphene. I show that the canonical theoretical descriptions fall short of explaining the experiments which lead us to revisit and unify the Elliott-Yafet and D'yakonov-Perel' mechanisms on common mathematical foundations and using similar physical assumptions (Ref. 3). Lately, we attempted to generalize the description for the case of large spin-orbit coupling (Refs. 4 and 5) and we argue that the relevant regimes have been already observed.

References:
[1] Simon et al. Phys. Rev. Lett. 101, 177003 (2008).
[2] Dora and Simon Phys. Rev. Lett. 102, 137001 (2009).
[3] Boross et al. Sci. Rep. 3, 3233 (2013).
[4] Kiss et al. Sci. Rep. 6, 22706 (2016).