Intrinsic spin-orbit torque in two dimensional antiferromagnets

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We consider spin torque generated by an electric current flowing through a two-dimensional(2D) collinear antiferromagnetic(AFM) layer subject to the Rashba spin-orbit coupling. In particular, we focus on the spin-orbit torque (SOT), which is the spin torque generated by the interplay between the current and the spin-orbit coupling. Considering small Fermi energy and strong exchange limit, we investigate the damping-like(DL) component of the SOT, or DL-SOT. Compared to the DL-SOT in a ferromagnetic case, we show that this torque in the AFM case is more sensitive to the exchange interaction and the electron density. Moreover while the intrinsic DL-SOT in the ferromagnetic case arises from the whole bands[1], in the 2D collinear AFM system, which is invariant under combination between time reversal and lattice translation symmetry operations, we show that certain specific bands are important to the DL-SOT.

Reference

[1] H. Kurebayashi et al., Nat. Nanotechnol. **9**, 211 (2014).