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Spin Torque and Its Efficiency in 3D Rashba Models with Localized Spins KAZUHIRO TSUTSUI, SHUICHI MURAKAMI, Tokyo Institute of Technology — In addition to the magnetization reversal by the spin-transfer torque, the magnetization reversal driven by a strong spin-orbit coupling has been intensely investigated experimentally and theoretically. In this presentation, we focus on 3D Rashba models coupled with localized spins, and study the spin torque theoretically. This is motivated by the recent discovery of BiTeI as 3D Rashba systems. As a result, we find that the spin torque in 3D Rashba models is largely enhanced in the high-carrier-density regime compared with 2D Rashba models. We also find that the spin-torque efficiency defined as the ratio between the spin torque and the electric current is enhanced when the Fermi energy lies on only lower band, both in 3D and 2D. As we change the Rashba spin-orbit coupling, the spin-torque efficiency becomes maximum when the Rashba spin-orbit coupling is comparable to the exchange coupling to the localized spins. The optimum spin-torque efficiency becomes large when the Rashba spin-orbit coupling is large, and it is preferable for the magnetization reversal with smaller amount of current injection.

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