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Interaction and multiband effects in the intrinsic spin-Hall effect of an interacting multiorbital metal NAOYA ARAKAWA, RIKEN CEMS — The spin-Hall effect is a spin-current version of the usual-Hall effect, and its potential for application may be great. For the efficient application utilizing the spin-Hall effect, an understanding of interaction effects may be helpful because the interaction effects sometimes become remarkable in transport phenomena (e.g., fractional-quantum-Hall effect). However, a lot of theoretical studies neglected the interaction effects, and the interaction effects in the spin-Hall effect had been little understood. To improve this situation, I developed a general formalism for the intrinsic spin-Hall effect including the interaction effects and multiband effects by using the linear-response theory with approximations appropriate for an interacting multiorbital metal (see arXiv:1510.03988). In this talk, I explain how the electron-electron interaction modifies the spin-Hall conductivity and show several new and remarkable interactions effects, new mechanisms of the damping dependence and a crossover of the damping dependence in a clean system and a temperature-dependent correction due to the spin-Coulomb drag. I also show guidelines useful for general formulations of other transport phenomena including the interaction effects and multiband effects.

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