

Spin-Wave, Spin Current and Spin Seebeck Effect

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The collective magnetic excitation of spin, i.e., spin-wave (magnon), in a ferromagnetic insulator carries the spin current [1]. When the spin current is generated by the electric voltage via the spin Hall effect, it transmits the electric signal in the insulator [2]. On the other hand, when it is generated by heat, it carries the thermal energy, i.e., the Spin Seebeck effect [3]. Here, we formulate the spin current in a ferromagnetic insulator generated by electric voltage [4] and heat [5] based on the fluctuation-dissipation theory. The numerical simulation of a variety of the transmission phenomena is presented in the ferromagnetic-insulator/nonmagnetic-metal hybrids.

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