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Theory of thermal spin-charge coupling in electronic systems[1]
BENEDIKT SCHARF, Department of Physics, University at Buffalo SUNY, Buffalo, New York 14260, USA, ALEX MATOS-ABIAGUE, Institute for Theoretical Physics, University of Regensburg, 93040 Regensburg, Germany, IGOR ŽUTIĆ, Department of Physics, University at Buffalo SUNY, Buffalo, New York 14260, USA, JAROSLAV FABIAN, Institute for Theoretical Physics, University of Regensburg, 93040 Regensburg, Germany — The interplay between spin transport and thermoelectricity offers several novel ways of generating, manipulating, and detecting nonequilibrium spin in a wide range of materials. Here, we formulate a phenomenological model in the spirit of the standard model of electrical spin injection to describe the electronic mechanism coupling charge, spin, and heat transport and employ the model to analyze several different geometries containing ferromagnetic (F) and nonmagnetic (N) regions: F, F/N, and F/N/F junctions which are subject to thermal gradients (i.e., the spin-dependent Seebeck effect). Furthermore, we study the Peltier and spin-dependent Peltier effects in F/N and F/N/F junctions.

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