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Corresponds between Spin-Hall Effect and Ordinary Hall Effect ROKSANA GOLIZADEH-MOJARAD, SUPRIYO DATTA, School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN-47906, USA — The "spin-Hall effect" has recently attracted a lot of attention and a central question is whether the effect is due to the *intrinsic* spin-orbit interaction or due to spinasymmetric scattering by *extrinsic* impurities. We shed light on this question using a new approach based on the non-equilibrium Green function (NEGF) formalism, which allows us to go continuously from the ballistic to the diffusive limit and we present approximate analytical expressions that describe our results fairly well. We establish a correspondence between Spin Hall effect and Ordinary Hall effect, since from our point of view these two effects are quite similar. Our model suggests that a spin accumulation proportional to the current should be observed in clean ballistic samples and we show how this spin accumulation evolves as momentum and/or spin relaxation processes are introduced in a controlled way. We further show good quantitative agreement with recent experimental observations in GaAs suggesting that these can be understood in terms of an intrinsic effect driven by the Rashba interaction, although experiments on ZnSe likely have a different origin.

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