

Abstract Submitted
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Nonvanishing spin Hall Effect in a square-lattice system SHUICHI MURAKAMI, Department of Applied Physics, University of Tokyo — Recently, it has been debated whether the spin Hall effect vanishes or not in the presence of impurities. To investigate this problem, we study a generic model on a square lattice with broken inversion symmetry, modelling a 2D semiconductor in a heterostructure. We adopt the Kubo formula and Keldysh formalism, assuming the clean limit from the disordered system. In the Keldysh formalism, the less Green function $G^<$ has two pieces contributing to the spin Hall effect. One is proportional to n_F (contribution from the filled states) while the other is to n'_F (contribution from the Fermi surface), where n_F is the Fermi distribution. Both of these two pieces are intrinsic, as they are nonzero in the clean limit. In general models they do not cancel with each other. The Rashba model is exceptional as they cancel each other exactly by accident. We discuss a condition when the spin Hall effect becomes larger. In the spin Hall insulators, the spin Hall effect merely consists of the contribution from the filled states.

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