Current-induced spin phenomena in systems with spin-orbit interaction

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Electric field and/or temperature gradient in systems with spin-orbit interaction can generate various spin-related phenomena. In general, the spin-orbit coupling in two-dimensional systems has not only a uniform component, but also spatially fluctuating term, eg. due to random distribution of dopant ions or imperfections of quantum-well interfaces. We consider theoretically the spin Hall effect and current driven spin polarization in two-dimensional semiconducting heterostructures [1,2]. We consider two different forms of Dresselhaus spin-orbit coupling, which appears in ⟨001⟩ and ⟨110⟩ quantum wells, respectively, in the presence of constant and random Rashba terms. To determine the spin conductivity and spin polarization we use the Green function technique and diagrammatic representation of the Kubo formula.

References:
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