Título	**Rashba Effect and Control of Spin Transport in Semiconductor Quantum Wires: a Three-Dimensional Approach**
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Vinculação a projetos	
Descrição	The possibility of spin transport control in semiconductor nanostructures is the basis of a new kind of electronics, spintronics. Differently from the conventional one, it is based on electronic spin, instead of electronic charge. The first spintronic device, a spin-FET (Field Effect Transistor), was proposed more than ten years ago, but, until now, not realized. On the experimental point of view, the difficulties are related to the mismatch of the electronic structures of the ferromagnetic material used as contact and semiconductor used as channel what imposes a low degree of polarization on the injected current. At the same time, on the theoretical point of view, a serious obstacle is the lack of a rigorous description of spin-orbit interactions in semiconductors. In narrow gap semiconductor heterostructures, the spin-orbit interaction due to the asymmetry of the confining potential, Rashba effect, is the most important one. In this work, we present a three-dimensional model to describe the Rashba effect in semiconductor heterostructures based on a eight band Kane model. The main advantages of our approach are: (i) no extra parameters are necessary to describe the interaction and (ii) the mixing of the three coordinates dynamics can be fully included. Essentially, we work in the effective mass and envelope function frameworks using spin dependent boundary conditions. The system is divided in convenient regions and the respective Hamiltonians are independently solved. The continuity of the wave function and its derivative is imposed through mode matching method. More specifically, we are interested in GaAs quantum wires with constrictions in the ballistic and linear transport regime. The contacts are represented by noninteracting electron gases. Our first results are shown.
Palavras chave	Semiconductor heterostructure, quantum wire, spin transport, Rashba effect, spintronics.