

Abstract Submitted  
for the MAR11 Meeting of  
The American Physical Society

**Spin manipulation in carbon nanotubes: All electrical spin filtering through spin-orbit interactions**<sup>1</sup> G. S. DINIZ, Ohio University, Athens-OH - USA, A. LATGÉ, Instituto de Física, Universidade Federal Fluminense, Niteroi - Brazil, S. E. ULLOA, Ohio University, Athens-OH - USA — Carbon nanotubes (CNTs) are known to exhibit interesting physical properties, such as metallic or insulating behavior for different chiral vectors. Application of external electric fields and the presence of spin-orbit interaction (SOI) result in modification of the energy level structure of CNTs and their conductance profiles. SOI couples spin and orbital degrees of freedom in these nanostructures, and we explore this effect in this work. We present calculations of the electronic transport of different single-wall CNTs in the presence of SOI. Our calculation uses a single-orbital tight-binding Hamiltonian representation and the equilibrium surface Green's function formalism [1] to calculate electronic transport. We consider the effects of both Rashba and intrinsic SOIs. Our results show possible implementations of carbon nanotubes as spin filtering devices for spatially asymmetric electric fields. We further discuss the spin polarization for different CNT size, chirality, field strength, and the spatially varying fields induced by the adsorption of DNA on their surface.  
[1] M. B. Nardelli, Phys. Rev. B **60**, 7828 (1999).

<sup>1</sup>Supported by NSF and CAPES/Fulbright

Ginetom Diniz  
Ohio University, Athens-OH

Date submitted: 19 Nov 2010

Electronic form version 1.4