Abstract Submitted for the MAR10 Meeting of The American Physical Society

Is there hope for spintronics in one dimensional realistic systems? ALEXANDRE ROCHA, Centro de Ciências Naturais e Humanas, Universidade Federal do ABC, THIAGO MARTINS, ADALBERTO FAZZIO, ANTONIO J.R. DA SILVA, Instituto de Física, Universidade de São Paulo — The use of the electron spin as the ultimate logic bit can lead to a novel way of thinking about information flow. At the same time graphene, a gapless semiconductor, has been the subject of intense research due to its fundamental properties and its potential application in electronics. Defects are usually seen as having deleterious effects on the spin polarization of devices and thus they would tend to hinder the applicability of spintronics in realistic devices. Here we use a ab initio methods to simulate the electronic transport properties of graphene nanoribbons up to 450 nm long containing a large number of randomly distributed impurities. We will demonstrate that it is possible to obtain perfect spin selectivity in these nanoribbons which can be explained in terms of different localization lengths for each spin channel. This together with the well know exponential dependence of the conductance on the length of the device leads to a new mechanism for the spin filtering effect that is in fact driven by disorder. Furthermore, we demonstrate that this is an effect that does not depend on the underlying system itself and could be observed in carbon nanotubes and nanowires or any other one-dimensional device.

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Date submitted: 20 Jan 2010

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