Electrically Tunable Spin Polarization in a Carbon-Nanotube Spin Diode

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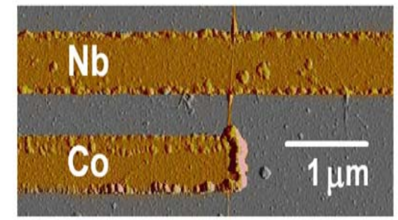
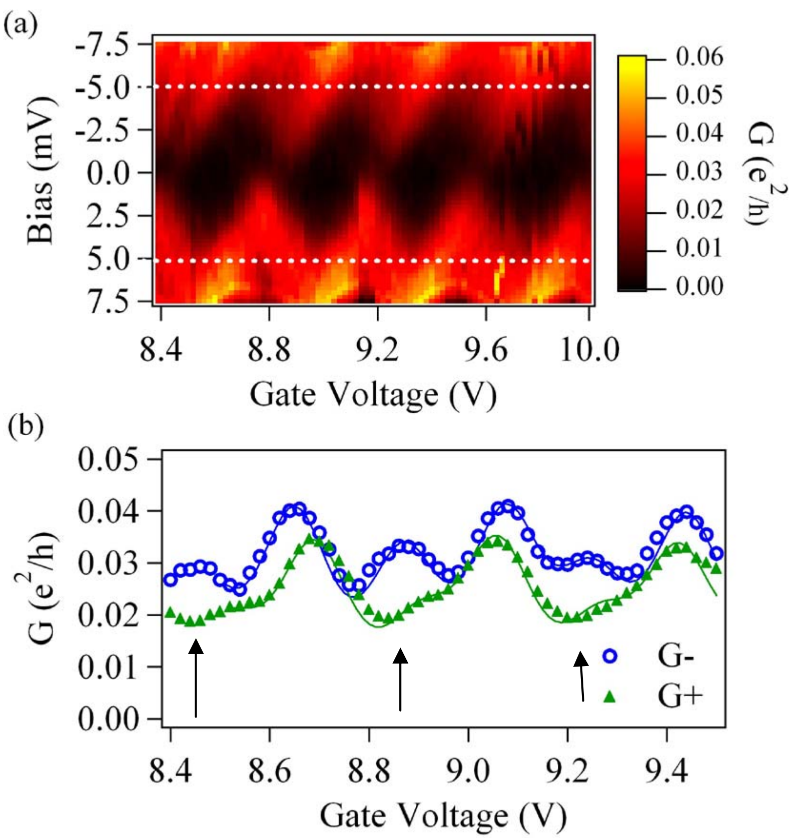
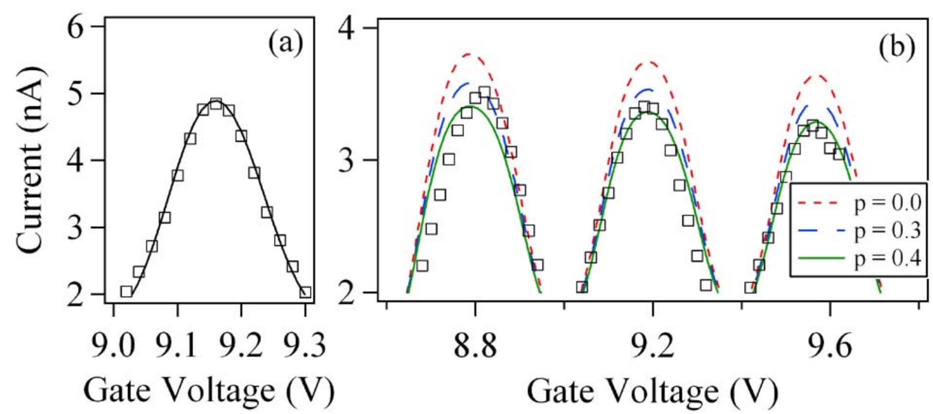
We have measured the current through a carbon nanotube quantum dot contacted by FM (Co) and normal (Nb) leads (right). For the values of gate voltage at which the normal lead is resonant with the single available non-degenerate energy level on the dot, we observe a pronounced decrease in the current for one bias direction (below).

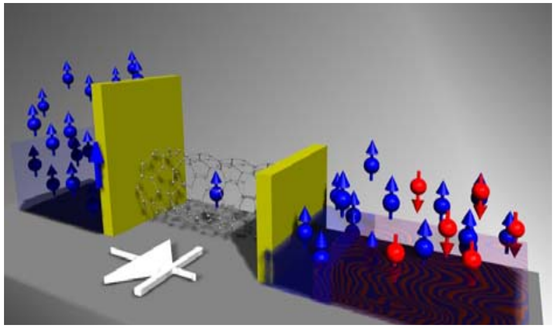






We show that this rectification is spin-dependent, and that it stems from the interplay between the spin accumulation and the Coulomb blockade on the quantum dot. Our results imply that the current is *spin-polarized* for one direction of the bias, and that the degree of spin polarization is fully and precisely tunable using the gate and bias voltages. As the operation of this spin diode does not require high magnetic fields or optics, it could be used as a building block for electrically controlled spintronic devices.

C. A. Merchant and N. Markovic, "Electrically tunable spin polarization in a carbon nanotube spin diode", Phys. Rev. Lett. 100, 156601 (2008).



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