Spin-cell for spin-current

Qingfen Sun[1], Jian Wang[2] and Hong Guo[1]

[1]Center for the Physics of Materials and Department of Physics, McGill University, Montreal, PQ, Canada H3A 2T8[1].
[2]Department of Physics, The University of Hong Kong, Pokfulam Rood, Hong Kong

We propose and theoretically investigate spin-cell devices which provide the necessary spin-motive force to drive a spin current for future spintronic circuits. The spin-cell has four basic characteristics: (i) it has two poles so that a spin current flows in from one pole and out from the other pole, this way a complete spin-circuit can be established; (ii) it has a source of energy to drive the spin current; (iii) it maintains spin coherence so that a sizable spin current can be delivered; (iv) it drives a spin current without a charge current.

We discuss and analyze two designs of the spin-cell device, both are based on lateral quantum dots in 2DEG. The first design is based on photon assisted process[1] while the second is gate controllable without involving time dependent fields[2]. The proposed spin-cell for spin current should be realizable using technologies presently available.

[1] Qing-feng Sun, Hong Guo, and Jian Wang, to appear in Phys. Rev. Lett. (2003).

[2] Wen Long, Qing-feng Sun, Jian Wang and Hong Guo, to appear in Appl. Phys. Lett. (2003).

[1]email: guo@physics.mcgill.ca