Nanoscale physics

Transport and magnetic properties in carbon nanotubes

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In this work we described the magnetic and transport properties in carbon nanotubes based on a tight binding model, using a single π- band and taking into account the spin. Using the two-dimensional band structure of graphene we obtained the one-dimensional (1D) band structure of a (n, m) nanotube [1,2].

We show that the application of an external magnetic field produces changes in transport properties of carbon nanotubes. In the presence of a transversal magnetic field was found a decrease of the Fermi velocity and an increase of the density of states in metallic nanotubes while the energy gap is suppressed in semiconducting nanotubes [3].

When the magnetic field applied is parallel to the tube axis, appear a new phase factor, known as the Aharonov-Bohm (AB) quantum phase [3]. The Aharonov-Bohm effect is a fundamental phenomena for quantum theory and it's important for applications in mesoscopic interferometric devices. We have demonstrated the universality of the integer *($\phi 0$)* and half-integer *($\phi 0/2$)* magnetic-flux periods in the AB effect in carbon nanotubes with zigzag boundary conditions. The sawtooth-type oscillations with *($\phi 0$)* and *($\phi 0/2$)* periods are dominated by an odd-even alternation in the electron number [4].

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