MESOSCOPIC TRANSPORT IN CARBON NANOTUBES : ANOMALOUS MAGNETORESISTANCE PHENOMENA AND QUANTUM DECOHERENCE

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Carbon nanotubes are known to be expectionally good ballistic conductors having elastic mean free path larger than the micron for the usually synthesized arc discharge or CVD-growth single-walled systems.

When intentionnally doped by Boron or Nitrogen, novel quasi-1D disordered systems are made manifestating transport properties that go beyond the conventional framework of weak localization. In particularn an electron-hole assymetry is found, having unique consequences on the magnetoresistance patterns.

We will first discuss several unconventional mesoscopic transport phenomena in such chemically doped carbon nanotubes, with emphasis on new quantum features unique to these heteroatomic systems.

Second, the effect of electron-phonon coupling on quantum coherence and dissipation will be addressed. The effect of several kinds of phonon modes will be considered on the conductance scaling properties, the coherence lengths and coherence times.

References

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