Carbon Nanotubes and Exotic Transport Properties

Tsuneya Ando

Department of Physics, Tokyo Institute of Technology
2-12-1 Ookayama, Meguro-ku, Tokyo 152-8551, Japan

A carbon nanotube is composed of concentric tubes of rolled two-dimensional graphite sheets, on which hexagons are arranged in a helical fashion about the axis [1]. The diameter of a multi-wall nanotube ranges from 20 to 300 Å and that of a single-wall nanotube lies between 7 and 16 Å [2,3]. The maximum length of nanotubes exceeds 1μm. Since the first discovery quite a number of studies have been reported on their electronic properties because of their unique topological structures. The purpose of this talk is to give a brief review on recent theoretical investigations on transport properties of carbon nanotubes (see [4] for details on some of the topics).

The topics include an effective-mass description of electronic states and close relationship with neutrino physics [5], absence of backward scattering except for scatterers with a potential range smaller than the lattice constant [6] and some examples of related experiments on dot formation [7,8], the presence of a perfectly transmitting channel when several bands coexist at the Fermi level, and its sensitivity to the presence of inelastic scattering limiting the phase coherence length [9].

References

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