Transport modeling for Nanowires and Nanotubes

Quasi-onedimensional nanostructures have attracted much interest
as they are recognized as promising building blocks for future
nano-electronic devices. A model for electronic transport in
these structures has to address various physical effects:
Quantum mechanical confinement, tunneling and
interference, coupling of
the semiconductor region to the contacts (open systems), non-
equilibrium
conditions (voltage applied to the contacts, irradiation),
electron-phonon scattering and electron-photon interaction.
The
non-equilibrium Green's function (NEGF) technique has proven
well suited
for the numerical study of such problems. A device simulator
based on
the NEGF method and a tight-binding model for the band
structure has
been developed. We present a numerical analysis of the
thermo-electric
properties of scaled silicon nanowires, and of the opto-
electronic
response of CNT-based photodetectors.