Hewageegana, P.
PAPER

Polarizability per Unit Length of a Nanowire including Nonlocal Effects

P.Hewageegana, Department of Physics, University of Kelaniya

It is well known that the electronic and optical properties of very small structures such as, nanospheres, nanowires, nanocavities and nanocylinders are very different from those of the corresponding bulk materials because of the surface effects. Nanosystems possess unique properties different from those of macroscopic materials when characteristic lengths govern their properties. Therefore, the spatial dispersion becomes much more important where the characteristic size of the particle or distances between them becomes comparable to the characteristic scale of the system.

We have developed a method for calculating transverse static polarizability (per unit length) of a bulk nanowire by taking into account the temporal and spatial dispersion. To describe these phenomena, we developed an analytical theory based on local random-phase approximation and plasmon pole approximation. This theory is very general in the sense that it can be applied to any material which can be characterized by a bulk dielectric function of the form $\varepsilon(k,\omega)$. The theory is applied to calculate the transverse static polarizability of dielectric and metallic nanowires.