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Optical properties of C_{60} molecules: A quasi-static approximation

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Abstract

In this paper, the optical properties of a C_{60} molecule is studied within the framework of the quasi-static approximation. To do this, a C_{60} molecule is modeled by an infinitesimally thin spherical shell of the π and σ electrons and electronic excitations of this shell are described by means of the two-dimensional two-fluid hydrodynamic theory. At first, the general expression for polarizability of the system is obtained, by solving Laplace and hydrodynamic equations with appropriate boundary conditions. Then, by using the polarizability formula, the extinction spectrum of the system is investigated, which is in a good agreement with the results of the Mie theory. Also, the Maxwell-Garnett theory for the effective medium approximation of the composite materials is developed to study the dielectric response of a composite of C_{60} molecules.

Keywords: C_{60} molecule, quasi-static approximation, Maxwell-Garnett theory

For full article, refer to the Persian section