ELS-XV-2015 Abstracts
ELS-XV-2015-116
Electromagnetic & Light Scattering XV 2015, Leipzig

Optical properties of magnetoplasmonic nanoparticles with a core-shell morphology and periodic structures of such

A. Christofi (1), P. Varytis (2), and N. Stefanou (2)

(1) Institute of Nanoscience and Nanotechnology, National Center for Scientific Research "DEMOKRITOS", Athens, Greece (a.christofi@inn.demokritos.gr), (2) Department of Solid State Physics, National and Kapodistrian University of Athens, Athens, Greece

Composite magnetoplasmonic nanoparticles with a core-shell morphology offer impressive opportunities for tailoring the light-matter interaction at subwavelength dimensions in a controllable manner. The optical properties of these particles are usually analyzed in the framework of the quasistatic approximation. However, this approximation often turns out to be inadequate and, in such cases, a full electrodynamic treatment is required. In this respect, we develop a rigorous method for an accurate description of electromagnetic scattering by a gyrotropic sphere coated with a nongyrotropic concentric spherical shell, based on the full multipole expansion of the wave field in the different regions and subsequent matching at the core-shell and shell-host interfaces. Moreover, we implement this method into the layer-multiple-scattering computational methodology, which is ideally suited for the study of three-dimensional assemblies of different types of nonoverlapping particles arranged with the same two-dimensional periodicity. Applications on specific examples of magnetic (metallic or dielectric)-plasmonic spherical core-shell nanoparticles and periodic structures of such reveal the occurrence of intriguing magnetoplasmonic effects including strong circular dichroism, enhanced Faraday rotation, and nonreciprocal optical response that can emerge as a result of the simultaneous lack of time-reversal and space-inversion symmetries.