Poster

Optical properties of nanostructured metamaterials

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Optical properties of certain classes of metamaterials composed of metallic nanoparticles are investigated from a theoretical point of view. We first consider materials composed of layers of periodically disposed particles and analyze the anisotropic dielectric function of these systems as a function of frequency and layer spacing. The dielectric function is obtained by solving Maxwell's equations using a layer-KKR method and by comparing the reflectance of planar surfaces of such materials with Frenel's equations for different angles of incidence and polarizations of the incoming light. The degree of anisotropy of these materials is assessed. Plasmon resonances of the nanoparticles are shown to mix and split as a result of particle-particle interaction, leading to complex features in the response function. Furthermore, we consider materials with a dilute content of metal, formed by metallic nanoparticle aggregates inside a dielectric matrix. The limit of strong interaction between the particles is considered in detail, in which case strong resonances in the optical properties of the resulting materials are predicted.