SINGLE-ELECTRON OPTICAL PROPERTIES OF METAL NANOSHELLS WITH A NONCONCENTRIC CORE. ACCOUNT OF ELECTRON SPECTRUM QUANTIZATION

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S u m m a r y

Single-electron optical properties of a spherical nanoparticle composed of a dielectric core and a thin metallic shell and characterized by a slight shift of the core center with respect to the geometric center of a nanoparticle have been studied in the frequency range far from the plasmon resonance, where the contribution of the single-electron component is considerable. A model that allows the wave functions and the wavenumber spectrum for an electron in the shell of a composite nanoparticle of this type to be obtained is proposed. The model is used to obtain the matrix elements of optical transitions and the single-electron optical conductivity of a nanoparticle both with and without (semiclassical conductivity) quantization of the electron energy spectrum in the shell. It is shown that the aforementioned quantization effects result in the appearance of the oscillatory dependence of the optical conductivity of a nanoparticle on the light frequency. It is demonstrated that the influences of the center shift and the spectrum quantization on the optical conductivity of a nanoparticle can be considered independently in the first approximation.