Nanoscale physics

Plasmon resonance in the periodic square nanowires on dielectric substrates

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Plasmon resonance in the gratings on base of silver or gold periodic square nanowires has been researched by rigorous coupled wave analysis (RCWA). Cross-sections of the nanowires are selected 30×30 nm^2 and 50×50 nm^2. Period of such structure was varied from 0.06 μm to 0.25 μm. Modified RCWA has been used for better convergence [1]. The spectral dependences of absorption, transmission and reflectance were obtained in wavelength range from 0.3 to 0.7 μm. In additional, a field distribution was calculated on the interfaces grating-air and grating-substrate.

It is determined, that absorption maximum is at wavelengths 0.42 μm for silver and 0.52 μm for gold gratings. These wavelengths correspond to absorption maximum of spherical nanoparticles of conformable metals. Since, an imaginary part of dielectric constant of silver is in five times less than imaginary part of dielectric constant of gold there is necessary to use significant more coupled waves for calculation characteristics of silver gratings in comparison to gold gratings. Moreover, absorption is higher in the silver gratings than in the gold gratings at resonance wavelengths. As a result, electromagnetic fields on resonance wavelengths which occur in silver nanogratings are significant higher than in gold nanogratings.

1. *Fitio V., Yaremchuk I., Bendzyak A., Bobitski Y.* Modified RCWA Method for Studying the Resonance Diffraction Phenomena on Metal Gratings // Proc. IEEE 37th International Conference on Electronics and Nanotechnology, April 18-20.-2017.-P. 170 – 174.