

Nanoplasmonics and surface enhanced spectroscopy

Effect of Metal Nanoshells on Light-harvesting by LH2 Complexes from Photosynthetic Bacteria

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Effect of placing a metal nanoshell near the peripheral light-harvesting complexes (LH2) from photosynthetic bacteria on efficiency of the photosynthesis process was studied. The formation of the hybrid state of the plasmons of the nanoshell and molecules of the ring leads to the shift of electronic levels as well as to the change of the probability of the excitonic transition in the LH2 complex. The optical absorption of the hybrid system may increase due to the “borrowing” from the very high dipole plasmon transition intensity by the intensity of the exciton transition [1]. The parameters of the metal (gold and silver) nanoshells required to increase the effectiveness of the light harvesting have been estimated on the base of the kinetics of the exciton transfer to the molecular entities further in the photosynthetic antenna. The nanoshell size dependence of the plasmon state damping was taken into account. It was shown that the oscillator strength of the optical transition may be increased in several times.

The effect of the location of the silver nanoshell relative to the ring has been considered. For nanoshells with small radii (of about the ring radius) located asymmetrically with respect to the molecular ring, the absorption is additionally enhanced due to the appearance of transitions that are forbidden in the case of symmetric arrangement.

1. Goliney I.Yu., Sugakov V.I., Valkunas L., Vertsimakha G.V. Effect of metal nanoparticles on energy spectra and optical properties of peripheral light-harvesting LH2 complexes from photosynthetic bacteria // *Chemical Physics*.-2012.-**404**.-P.116–122.
2. Vertsimakha G.V., Effect of the relative spatial arrangement of a metal nanoshell and an LH2 complex of photosynthetic bacteria on the optical properties of the hybrid light-harvesting structure”//*Ukr. J. Phys.*- 2014.-**59**.-P.158-166.