

Nanooptics and photonics

Influence of silver nanoparticles on fluorescence intensity of Rhodamine 6G in case of different dye concentration.

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In this work dependence of fluorescence intensity of liquid composites consisting from laser dye Rhodamine 6G and silver nanoparticles from concentration of both components was investigated with a different frequency of exciting radiation.

Silver nanoparticles (SNP) of 64 nm average diameter, were prepared by citrate reduction of AgNO₃. A typical surface plasmon resonance (SPR) band with maximum at approximately 420 nm was observed. The SNP size was determined by correlative spectroscopy method. As solvent in case of manufacture of liquid aggregates the mix of water and ethanol in the ratio 1:1 was used.

Fluorescence of samples was excited by the radiation of blue and green LEDs with intensity maxima on 460 and 516 nanometers, respectively. Intensity of fluorescence was measured on wavelength of 562 nm. Concentration of dye in samples changed from $0,625 \cdot 10^{-2}$ to 0,1 mmol/l, and concentration of SNP changed from 0 to 0,25 mmol/l.

In results of measurements it was determined that the level of gain of fluorescence intensity in case of increase in SNP concentration of subjects is less, than more dye concentration. In particular, in case of excitation by a green LED of composites with dye concentration more 0,05 mmol/l increase in SNP concentration leads to reduction of intensity of fluorescence. For composites with smaller dye concentration under the same conditions increase of intensity of fluorescence was watched. The maximum gain of intensity for 25% arose in a composite with the smallest concentration of dye. In case of excitation by a blue LED increase in SNP concentration led to increase of fluorescence intensity of samples with all dye concentration. The maximum gain of fluorescence twice was also watched for a composite with the smallest concentration of dye. It is necessary to mark that in case of blue excitation fluorescence amplified more considerably, than in case of green pump. It confirms that increase of fluorescence intensity of subjects is more, than the wavelength of exciting radiation is closer to a maximum of SPR band.

Thus, experimentally it was set that dye concentration in a nanocomposite influences nature of interaction between molecules of dye and metal nanoparticles.