**Nanooptics and photonics**

**Metal-Enhanced Fluorescence and FRET in Binary Dye Solution co-doped with Ag Nanoparticles.**

**K.S. Nikolaiev 1, S.V. Nikolaiev 1, V.V. Pozhar 1, M.I. Dzyubenko1**

*1 Usikov Institute for Radiophysics and Electronics National Academy of Sciences of Ukraine, 12 Acad.Proskura st., Kharkiv, 61085, Ukraine.*

*E-mail:* *svnikolaeyev@gmail.com*

In this report, we investigated the effect of silver nanoparticles (SNP) on both the fluorescence intensity and efficiency of Förster resonant energy transfer (FRET) in binary solutions of laser dyes Rhodamine 6G (Rh6G) as the donor and Sulforhodamine 101 (Srh101) as the acceptor. The average SNP radius was 32 nm and the maximum of the plasmon resonance spectrum was located near 428 nm. Fluorescence of samples was excited by radiation with a spectral maximum at 528 nm and a half width of 8 nm.

 The studies were conducted on four samples of mixtures with different concentrations of donor and acceptor molecules, both doped with nanoparticles and without them. The concentration of silver in nano-doped solutions was equal to 0,025 mM. The concentrations of dyes in each of the samples are shown in the table below. The table also shows the values of the ratio of the nano-additives absorbance to the dye mixture absorbance (A).

During the experiments, the plasmon enhancement coefficient (G) of the mixtures fluorescence and the efficiency of energy transfer from the donor to the acceptor with (E) and without (E \*) SNP were measured. The data obtained are given in the table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| The dyes concentration in the samples, mM | A | G | E | E \* |
| 0,15 Rh6G + 0,06 Srh101 | 0,025 | 1,0 | 0,25 | 0,26 |
| 0,15 Rh6G + 0,006 Srh101  | 0,027 | 1,0 | 0,07 | 0,08 |
| 0,06 Rh6G + 0,15 Srh101 | 0,044 | 1,03 | 0,24 | 0,28 |
| 0,006 Rh6G + 0,015 Srh101 | 0,56 | 1,2 | 0,09 | 0,17 |

The results showed that the addition of SNP to the binary solution of dyes can lead to increased fluorescence and an increase in the efficiency of FRET. At the same time, the degree of the effect depends on the ratio of the mixture components concentrations. For mixtures with the lowest values of A and low acceptor concentrations, no enhancement of fluorescence was observed, and an increase in the efficiency of FRET was small. The greatest increase in fluorescence and an increase in the efficiency of RET were observed for the sample with the highest A.