EFFECT OF GOLD NANOPARTICLES ON COUMARIN DYE AND QUANTUM DOT MIXTURE IN POLYMER MATRIX

Aldongarov A.[1], Irgibaev I,[2], Mantel A.[3] and Mukataev I.[2]

[1]L.N. Gumilyov Eurasian National University, Department of Technical Physics, Astana, Kazakhstan
[2]L.N. Gumilyov Eurasian National University, Laboratory of Physical and Quantum Chemistry, Astana, Kazakhstan
[3]Luminescent Materials Research Center Ltd., Astana, Kazakhstan
enu-2010@yandex.kz

Thin films of PMMA samples containing coumarin dye C-440, semiconducting quantum dots (QDs) CdS_xSe_{1-x}/ZnS and 3 nm gold nanoparticles (GNPs) were prepared. Measurements of luminescence spectra of the samples show that for this three component system presence of GNPs may increase emission intensity of QDs while for two component system of QDs and GNPs no such increase is observed. It is suggested that fluorescence resonance energy transfer (FRET) takes place in the three and two component system since increase of QDs emission happens at the expense of decrease of C-440 emission intensity. We have used DFT level of approximation to consider a model of three component system. This model has included single C-440 molecule, two Au_5 and Zn_6Se_6 clusters. Theoretical results show that addition of GNPs may provide increase of absorption rate of C-440 in two component system (C-440+GNPs) and in three component system (C-440+QDs+GNPs). While for QDs GNPs provide decrease of absorption probability. It is shown that absorption properties of QDs and C-440 do not depend on their relative positions.