Nanoscale physics

energy transfer in CeF_3:Tb nanoparticles - CTAB shell – Chlorin e_6 system

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Photodynamic therapy (PDT) is the method of cancer treatment where the photosensitizing molecules accumulated in the tumour tissue are excited by light and then transfer their excitation energy to the oxygen, thus generating its toxic species that damage the tumour tissue. The main drawback of this method is the limited depth of the exciting beam penetration into the body. To overcome this problem, X-ray excited sensitizers were proposed [1]. Here we report the study of the electronic excitation energy transfer (EEET) in the CeF_3:Tb nanoparticles - cetrimonium bromide (CTAB) - chlorin e_6 nanosystem.

Excitation of the CeF_3:Tb - CTAB nanosystem at 250 nm resulted in the rather intensive luminescence of Ce and Tb. Addition of chlorin e_6 to this system resulted in the quenching of the CeF_3:Tb nanoparticles luminescence and appearance of the chlorin emission upon excitation of the nanoparticles. Besides, maximum at 250 nm corresponding to the nanoparticles absorption appeared in the excitation spectrum of chlorin e_6. Thus, the EEET from nanoparticles to chlorin molecules takes place. This conclusion is supported by the decrease in the decay time of Ce and Tb emission.

Thus electronic excitation energy transfer in the CeF_3:Tb-CTAB-chlorin nanosystem was demonstrated; detailed pathways of the excitation between the energy levels of CeF_3:Tb and chlorin as well as X-ray excited luminescence of this system will be further studied.

1. *W. Chen, J. Zhang, J. NanoSci. Nanotech.* **2006**, 6, 1159.