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Energy transfer between Rear Earth ions and Carbon Nanotubes.
TETYANA IGNATOVA, HIKMAT NAJAFOV, SLAVA V. ROTKIN, Lehigh University, Physics Department, 16 Memorial Drive East, Bethlehem, PA 18015 — We investigate a potentiality of rare earth (RE) ions for the sensibilization of the carbon nanotubes (NT) luminescence via the resonance-type energy transfer expected from the appreciable spectral overlap between the RE emission and the short-wavelength fraction of the NT absorption. RE spectroscopy combined with the time-resolved study of the excited states following the 20ps laser excitation was used to determine the transfer rate through the shortening of the RE luminescence decay time. In this study we mainly focus on the time-resolved spectroscopy of selectively excited Tb^{3+} and Eu^{3+} ions in water solution containing a high concentration of DNA-wrapped NT showed a clear sign of transfer from RE to NT. We propose that the electrostatic attraction between negatively charged DNA phosphate groups and positively charged RE ions (Tb^{3+} and Eu^{3+}) in water solution resulted in RE-DNA-NT complex formation with a suitable inter-species spacing for the energy transfer from RE to NT as well as the appreciable spectral overlap. The transfer has been confirmed by small (<10%) but systematic shortening of the RE emission in water solution containing DNA-wrapped NT.

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