The effect of surface ligand, solvent and Yb^{3+} co-doping on the luminescence properties of Er^{3+} in colloidal $NaGdF_4$ nanocrystals.

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Streszczenie

The emission properties of $NaGdF_4$ nanoparticles (NPs) doped with Er^{3+} and/or Yb^{3+} ions and their colloidal dispersions in different solvents were investigated. The organic ligands present on the surface of the NPs decrease the decay time of Er^{3+} emission. In contrast, virtually no change in decay times was observed after dispersing the NPs in solvents. Both surface ligands and solvent molecules exert a pronounced effect on the intensity ratio of the $^2H_{11/2} + {}^4S_{3/2} \rightarrow {}^4I_{15/2}$ and $^4F_{9/2} \rightarrow {}^4I_{15/2}$ transitions. Co-doping with Yb^{3+} is revealed as another important factor influencing the relative intensities of Er^{3+} emission bands. The influence of surface ligands and solvent molecules on emission spectra upon NIR excitation at 980 nm was investigated. The decay times of Er^{3+} emission were longer for Yb^{3+} co-doped NPs than for analogous NPs single doped with Er^{3+}. This is ascribed to a feedback energy transfer process between Yb^{3+} and Er^{3+}.

Adres publiczny

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https://www.rsc.org/