Nanocomposites and Nanomaterials

Enhanced Photoluminescence Intensity of CdS Nanoparticles via Ag Doping

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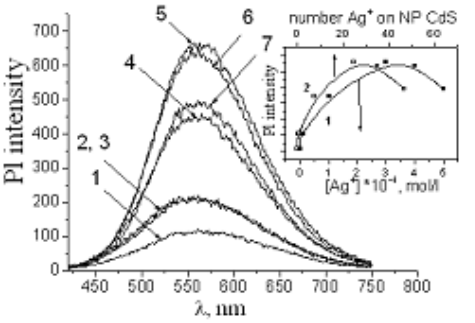

Fig.1 Photoluminescence spectra of CdS nanoparticles doped by silver ions of $2,6\times10^{-6}$ (1), 1×10^{-5} (2), 1×10^{-4} (3), 2×10^{-4} (4), 3×10^{-4} (5), 4×10^{-4} (6), 5×10^{-4} (7) M concentration. Inset: PL intensity as a function of silver ions amount(1) and Ag^+/CdS ratio (2).

Recent research in the field of doped colloidal nanoparticles showed a possibility of nanoparticle (NP) photoluminescence band enhancement via adding noble metal ions into colloidal solution [1]. We present a study on synthesis and characterization of CdS nanoparticles stabilized by mercapropropionic acid (MPA) with average size of 4,3 nm. We show that doping NPs with silver ions doesn't change their absorption properties, but it may have impact on their intrinsic cubic structure. On the other hand, the PL spectra of silver-doped NP photoluminescence show dramatic rise of PL intensity higher in 5 times, comparing to undoped samples (Fig 1).

An increase of PL intensity can be already achieved by adding silver ions in amount of 0,026% to CdS concentration (inset, curve 1).which is statistically estimated as 0,2 silver ion per one NP. The maximum of PL enhancement is reached under conditions of 25 silver ions per NP (inset, curve 2). We assume that the mechanism of PL intensification is based on the formation of new deep traps inside the NP bandgap, where occurs more energetically favourable radiative charge carrier recombination.

[1].Sahu A., Kang M. S., Kompch A., Nothoff C., Electronic Impurity Doping in CdSe Nanocrystals // Nano Let. – 2012. - **12**, N 5.-P. 2587-2594.