

259 Temperature and pH Dependent Luminescence in Water-Soluble CdTe Colloidal Nanocrystals

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Recently, the temperature-dependence of the nanocrystals (NCs) has been studied, and a variety of NCs has been employed as optical temperature probes which is widely required for more efficient applications in biology [1]. Although many extensive studies have been reported for the synthesis of CdTe NCs, one of the major challenges is to obtain water-soluble NCs with stable optical properties that are not affected by environmental factors [2].

In this work, we have investigated the effect of temperature on the luminescence properties of the CdTe NCs synthesized in aqueous colloidal solution and its relation with the preparation process. A series of colloidal CdTe NCs were prepared using the reaction between Cd²⁺ and sodium hydrotelluride (NaHTe) solution. Cd precursor solutions were prepared by mixing a solution of CdCl₂·2H₂O and thioglycolic acid (TGA) dissolved in ultra pure water [3]. The pH values of Cd-TGA complex were adjusted in the range 5.8-14.0. CdTe NCs were synthesized by addition of freshly oxygen-free NaHTe solution. The molar ratio of Cd²⁺:NaHTe:TGA was 1:0.5:2. The reaction mixture content the NCs, was refluxing at 95°C by 30, 60 and 90 min. The UV-Vis absorption spectra were measured at room temperature in the range 400-700 nm and the photoluminescence spectra was recorded using excitation laser with $\lambda_{ex} = 405$ nm and 1 mW of power. The measurements were performed at low temperature in the range 13-300K and to high temperature in the range 300-343 K.

Our results showed the presence of at least two radiative recombination centers. The emission peak decreases in the low energy region when the temperature increases from 13-300K and at high temperatures which indicates of the thermal "quenching" of this property. The linear behavior the photoluminescence with the

temperature shows that these CdTe NCs have high potential to be used as optical sensors for applications in luminescent thermometry.

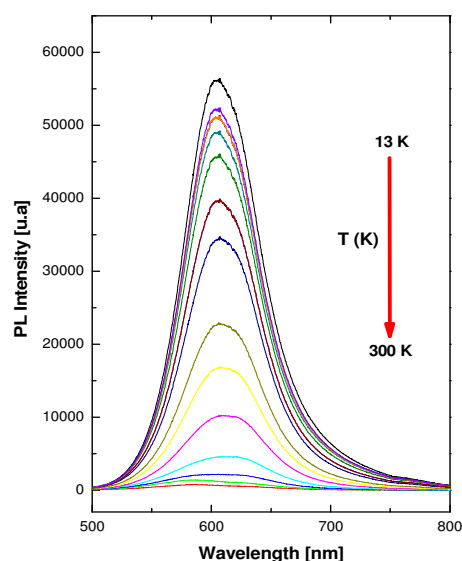


Fig. 1 PL emission spectra of the CdTe nanocrystals, excited at 405 nm in 13 – 300 K range temperature.

This work is supported by Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG). Acknowledgment to FUNDUNESP, PROPE

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