

# Nanocomposites and nanomaterials

## Formation of Zn-alloyed CdTe Quantum Dots

**O.O. Tynkevych**

*Department of Solid State Inorganic Chemistry and Nanomaterials,  
Yuriy Fedkovych Chernivtsi National University,  
Kotsiubynsky Str. 2, 58012, Chernivtsi, Ukraine  
E-mail: o.tynkevych@chnu.edu.ua*

Quantum dots (QDs) are important photoluminescent materials in number of applications such as biochemical analysis, solar cells, optoelectronics etc. *Incorporation of impurities* is an effective way to *tune* the optical *properties* of QDs.

Zn-alloyed CdTe QDs were prepared in aqueous phase under an argon atmosphere using thioglycolic acid (TGA) as a capping ligand by the method described in [1]. To understand the influence of Zn-precursor nature on the structure of prepared Zn-alloyed CdTe QDs two different types of Zn-precursors were used ( $\text{Zn}^{2+}$  and Zn-TGA complex). The first series of samples were obtained by the injection of  $\text{ZnSO}_4$  to freshly prepared CdTe nanoclusters and subsequent heating. The second series of samples were obtained by the same methodology using Zn-TGA precursor. One sample of CdTe QDs was used as a control.

Samples were characterized using UV-vis absorption and photoluminescent optical spectroscopic studies, cyclic voltammetry (CV) and Atomic emission spectroscopy (AES).

Using of  $\text{ZnSO}_4$  as a Zn-precursor the blue shift of absorption and photoluminescence spectra compared to CdTe QDs was observed. This indicates incorporation of  $\text{Zn}^{2+}$  in the CdTe QDs and formation of  $\text{Cd}_{1-x}\text{Zn}_x\text{Te}$  QDs. At cyclic voltammograms recorded for this sample additional cathodic peak was observed. That attributed electrochemical activity of impurity levels formed by  $\text{Zn}^{2+}$  on top of CdTe QDs valence band level. In the case of Zn-TGA precursor formation of CdTe/ZnS QDs with thick ZnS shell occurs. This is evidenced by red shift of absorption and photoluminescence spectra and disappearance of the electrochemical signal from CdTe core and appearance of ZnS shell signal instead.

We can conclude that changes in the synthetic procedure play an important role in the formation of Zn-alloyed CdTe QDs.

1. *Tynkevych O. O., Ranoszek-Soliwoda K., Grobelny J., Selyshchev O. V., Khalavka Y. B.* Spectroscopic and electrochemical monitoring of band structure changes during the alloying of CdTe QDs by  $\text{Hg}^{2+}$  ions // *Materials Research Express*.-2016.-**3(10)**.-P. 1-9.