

# Synthesis and Characterization of CdS Nanocrystals Produced by Using a Novel Stabilizer

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During the last decade, semiconductor nanoparticles have attracted great interest due to size dependent changes over some of their physical properties such as optical properties and photocatalytic activity etc [1,2]. CdS nanoparticle is one of the most intensively investigated semiconducting nanoparticles [3]. CdS nanoparticles can be synthesized by using various techniques and/or many kinds of templates [4-6]. Use of (co)polymers in this area is one of the most preferred system as template. Control of the location of the CdS nanoparticles within micelles is very important for a variety of applications. In most cases, a micelle core can be regarded as a nano-sized reactor, and core embedded nanoparticles can be synthesized by choosing a suitable polymer which gives good complexation with cadmium cation [7].

In this study, we used a novel block copolymer in the production of nanoCdS. In the first step, oligo(ethylene glycol)monomethyl ether monomethacrylate (OEGMA) was copolymerized with 2-(dimethylamino)ethyl methacrylate (DMA) and tetrahydropyranyl methacrylate (THPMA) via group transfer polymerization (GTP) as precursor polymer. In second step, THPMA residues of the POEGMA-*b*-(PDMA-*st*-PTHMPMA) were deprotected by acidic hydrolysis under mild conditions to get well-defined POEGMA-*b*-(PDMA-*st*-PMAA) copolymer.

POEGMA-*b*-(PDMA-*st*-PMAA) block copolymer formed near-monodispers micelles by the addition of CdCl<sub>2</sub> in the basic aqueous solution (pH 11.0) via formation of the micellar core with the complexation of MAA<sup>-</sup> anions with Cd<sup>+2</sup> cations. After addition of thioacetamide or thiourea into the micellar solution; polymer stabilized CdS nanocrystals were successfully obtained with the diameter of around 250 nm.

The band gap of CdS nanocrystals were obtained from the absorbance measurements in the visible range and found to be 2.35 eV. Their electrical resistivity was found to be 8.3x10<sup>6</sup> (Ωcm). XRD pattern of CdS nanocrystals indicated (110) and (220) diffractions related to the cubic CdS nanocrystals. Preferred crystallographic orientation of the CdS nanocrystals is (110). Transmission electron microscopy (TEM) has shown that grain sizes of CdS thin films vary between 70 and 144 nm. Atomic force microscopy (AFM) image has shown that the surface roughnesses of the CdS thin films on a glass substrate are about 100 nm. Grain sizes of CdS nanocrystals vary between 180 and 560 nm.

## References

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