

Highly luminescence, microwave assisted synthesis of water soluble carboxylic acid-functionalized CdTe Quantum Dots

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Common synthesis method of quantum dots (QDs) comprise organo-metallic precursor which are rapidly injected into extremely hot solvent under nitrogen/helium atmosphere to produce QDs nanocrystals [1,2].

A new method for synthesizing highly luminescence and high-quality QDs while circumventing these disadvantages has been developed.

In this study, nano-QDs crystals have core-cap structures consisting of CdTe core and mercaptosuccinic acid cap.

A facile one-pot microwave assisted reduction method has been elaborated for the synthesis of highly luminescent CdTe quantum dots using more stable Na_2TeO_3 as the Te and inexpensive CdCl_2 as Cd sources in an aqueous phase.

The synthesis parameters of this approach, including the time, the pH of the reaction solution and the molar ratio of the mercaptosuccinic acid (MSA): Cd, Na_2TeO_3 have considerable effect on the particle size and photoluminescence property of the CdTe quantum dots.

The photoluminescence quantum yield of CdTe quantum dots prepared using microwave irradiation and relatively short reaction times reached up to 86% with emission peaks at 500-650 nm.

Key words: Quantum Dots, luminescence, microwave\

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Determination of some heavy metals using modified magnetite in food and environmental samples by flame atomic absorption spectrometry after preconcentration

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Heavy metal pollutants in aquatic environments pose a severe threat to public health and ecological systems. Improper management of industrial water is one of the main causes of environmental pollution and degradation in many countries. Heavy metals are important species in these wastes and harmful to plants and animals. Considerable efforts have been made to develop effective treatment techniques for removing heavy metal ions from water; adsorption is probably the most common method in practical use. Nanosized magnetic particles are considered potential adsorbents for aqueous heavy metals due to their high surface area and the unique advantage of easy separation under external magnetic fields [1,2].

The structure of the resulting product was confirmed by FT-IR, XRD, TEM. We developed an efficient and cost-effective method for the preconcentration of trace amounts of Pb(II), Cd(II), Ni(II), and Cr(II) in environmental and biological samples using this novel magnetic solid phase. The possible parameters affecting the enrichment were optimized. Under the optimal conditions, the method detection limit was 0.37, 0.21, 0.03 and 0.18 $\mu\text{g L}^{-1}$ for Pb(II), Cr(II), Cd(II) and Ni(II) ions, respectively. The established method has been successfully applied to analyze real samples, and satisfactory results were obtained.

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Simultaneous determination of three metals using new Schiff base coated magnetite nanoparticles modified carbon paste electrode

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Magnetite and maghemite nanoparticles are common interesting iron oxides have many practical applications when present as nanoparticles. Magnetite nanoparticles (Fe_3O_4 NPs) have some advantages such as high surface area, electrical conductivity, magnetic and catalytic properties and also chemical stability while using in carbon paste electrode [1-6]. Also a review of literature revealed that the Schiff bases are the excellent choice as modifier for the fabrication of ion sensors due to their peculiar properties [7,8]. By incorporation of synthesized new Schiff base coated magnetite nanoparticles [9,10] into carbon paste electrode, a new modified electrode (MCPE) was constructed for simultaneous determination of three metals as Cd(II), Cu(II) and Hg(II) using square wave voltammetry. This method is rapid, very sensitive and selective as well. The enhanced voltammetric response at modified carbon paste was investigated compared to unmodified and the other manufactured modified electrodes and the mechanism was investigated by cyclic voltammetry. pH and different parameters such as deposition potential (V) and deposition time (s), were optimized using one variable at a time method and the effect of interference were studied as well. Under optimal conditions we take the advantage of the proposed method for simultaneous determination of these metals in aqueous real samples.

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