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MAS Capped CdTe/ZnS Core/Shell Quantum Dot Based Sensor for Detection of Hg(II)

Authors : Dilip Saikia, Suparna Bhattacharjee, Nirab Adhikary

Abstract : In this piece of work, we have presented the synthesis and characterization of CdTe/ZnS core/shell (CS) quantum dots (QD). CS QDs are used as a fluorescence probe to design a simple cost-effective and ultrasensitive sensor for the detection of toxic Hg(II) in an aqueous medium. Mercaptosuccinic acid (MSA) has been used as a capping agent for the synthesis CdTe/ZnS CS QD. Photoluminescence quenching mechanism has been used in the detection experiment of Hg(II). The designed sensing technique shows a remarkably low detection limit of about 1 picomolar (pM). Here, the CS QDs are synthesized by a simple one-pot aqueous method. The synthesized CS QDs are characterized by using advanced diagnostics tools such as UV-vis, Photoluminescence, XRD, FTIR, TEM and Zeta potential analysis. The interaction between CS QDs and the Hg(II) ions results in the quenching of photoluminescence (PL) intensity of QDs, via the mechanism of excited state electron transfer. The proposed mechanism is explained using cyclic voltammetry and zeta potential analysis. The designed sensor is found to be highly selective towards Hg (II) ions. The analysis of the real samples such as drinking water and tap water has been carried out and the CS QDs show remarkably good results. Using this simple sensing method we have designed a prototype low-cost electronic device for the detection of Hg(II) in an aqueous medium. The findings of the experimental results of the designed sensor is crosschecked by using AAS analysis.

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