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A triclosan turn-ON fluorescence sensor based on thiol-capped core/shell quantum dots

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ABSTRACT

Triclosan (TCS) is a common antimicrobial found in many personal care products. A large amount of TCS thus enters the wastewater system leading to the accumulation thereof in water sources. In this work, core-shell structured GSH-CdSe/ZnS fluorescent quantum dots (QDs) were synthesized based on organometallic synthesis with a thiol ligand capping agent. The GSH-CdSe/ZnS QDs showed excellent photostability and a photoluminescence quantum yield of 89%. The fluorescence of the GSH-CdSe/ZnS QDs was enhanced by the introduction of TCS, likely owing to fluorescence resonance energy transfer from TCS to the QDs, allowing for its use as a “turn on” fluorescence probe for the detection and determination of TCS. A linear response was observed in the range of 10-300 nmol L⁻¹ with limits of detection and quantification of 3.7 and 12.4 nmol L⁻¹ respectively. The probe displayed good recoveries (94%-117.5%) for the determination of TCS in tap and river water samples which demonstrated the suitability of this novel sensor for a monitoring application of environmental relevance.

Keywords: Triclosan, Personal care products, Quantum dots, FRET, Fluorescence spectroscopy.

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