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Selective Circular Dichroism Sensor Based on the Generation of Quantum Dots for Cadmium Ion Detection

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Abstract : A new approach for the fabrication of cadmium ion (Cd2+) sensor is demonstrated. The detection principle is based on the in-situ generation of cadmium sulfide quantum dots (CdS QDs) in the presence of chiral thiol containing compound and detection by the circular dichroism spectroscopy (CD). Basically, the generation of CdS QDs can be done in the presence of Cd2+, sulfide ion and suitable capping compounds. In addition, the strong CD signal can be recorded if the generated QDs possess chiral property (from chiral capping molecule). Thus, the degree of CD signal change depends on the number of the generated CdS QDs which can be related to the concentration of Cd2+ (excess of other components). In this work, we use the mixture of cysteamine (Cys) and L-Penicillamine (LPA) as the capping molecules. The strong CD signal can be observed when the solution contains sodium sulfide, Cys, LPA, and Cd2+. Moreover, the CD signal is linearly related to the concentration of Cd2+. This approach shows excellence selectivity towards the detection of Cd2+ when comparing to other cation. The proposed CD sensor provides low limit detection limits around 70 µM and can be used with real water samples with satisfactory results.

Keywords : circular dichroism sensor, quantum dots, enaniomer, in-situ generation, chemical sensor, heavy metal ion
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