Multi-stimuli Responsive Composite for heavy metal detection Based on Mesoporous Silica and Polyelectrolyte Brush

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Heavy metals are mostly non-degradable toxic substances, which are easy to be absorbed and enriched by organisms in the ecosystem, resulting in accumulation of the human body and difficult to be discharged. The electrochemical sensor is an effective method to detect heavy metal ions. Based on mesoporous silica, a multi-responsive block polymer brush PMAzo-PDMAEMA-SBA-15 was prepared by SI-RAFT method. Then the polymer brush was prepared into an electrochemical sensor to detect $[\text{Fe}(\text{CN})_6]^{3-}$, Cu^{2+} , Cd^{2+} by CV test, and the detection limit is about $1.0 \times 10^{-7} \sim 2 \times 10^{-6}$ mol/L. It was found that the linear relationship between peak reduction current and metal ion concentration is excellent so the electrochemical sensors can be used for quantitative detection of ions. In addition, we also tested the performance of the sensor under the different environments such as pH, temperature and ultraviolet light, and found that sensitivity and detection limit of the sensor would greatly increase at low pH and high temperature, and the UV-visible light could be used as the control switch of the sensor.

Keywords: Polyelectrolyte/mesoporous Silica, SI-RAFT, Environmental Response, Electrochemical Sensors, Metal Ions

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