

Functionalized Mn²⁺-Doped Zinc Sulfide Quantum Dots as a Metal Ion Sensor for Industrial Wastes

Guo-Feng Chen, Hsiao-Pin Tsai, Ping-Shan Lai and Ming-Yuan Liao*

Department of Chemistry, National Chung Hsing University, Taichung, 402, Taiwan

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L-Cysteine-capped Mn²⁺-doped ZnS quantum dots are prepared as a fluorescence probe for the detection of heavy metal contaminants, such as As₂O₄²⁻, Cd²⁺, CrO₄²⁻, Ni²⁺, Zn²⁺, Ca²⁺, Fe²⁺, Cu²⁺, Pb²⁺, Co²⁺, and Mn²⁺ ions. The results show that the L-cysteine-capped Mn²⁺-doped ZnS quantum dots exhibit good sensitivity and selectivity for the detection of copper ions. The optimized concentration of L-cysteine-capped Mn²⁺-doped ZnS quantum dots is determined as 2 mg/mL under pH 7.0 in phosphate buffer. The detection limit for this sensor system is 0.2 ppm with the linear range between 0.5 and 20 ppm. The effect of foreign ions such as Mn²⁺, Fe²⁺, Co²⁺, and Ni²⁺ on the detection of Cu²⁺ solution is also evaluated. The results show that there is no significant difference in the measurements.

*Corresponding author: e-mail: mliao@nchu.edu.tw