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Mn²⁺ doped ZnS QDs modified fluorescence sensor based on molecularly imprinted polymer/sol-gel chemistry for detection of Serotonin

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Abstract

A newly fluorescence probe for detection of Serotonin based on a Mn-doped ZnS quantum dots@silica nanoparticle@molecularly imprinted polymers (QDs@SiO₂@MIPs) was successfully created. QDs@SiO₂@MIPs were characterized by scanning electron microscope, transmission electron microscope, Fourier transform infrared spectroscopy, UV spectroscopy, X-ray powder diffraction, and fluorescence spectroscopy. A complex was produced between the amino group of QDs@SiO₂@MIPs and the hydroxyl group of 5-HT when 5-HT rebinding, the energy of the QDs would be transferred to the complex, which led to its fluorescence quenching. The composite material has a high selectivity with an imprinting factor of 5.96. The linear regression equation is $F_0/F=0.0036Cq-0.0512$, with a correlation coefficient of 0.9928 in a linear range from 50 to 500 ng/mL. The limit of detection (LOD) was 0.69 ng/mL. The probe exhibited simple preparation process, high sensitivity, good selectivity, low detection limit, short analysis time and could be applied to detect 5-HT in human serum successfully.

Graphical Abstract

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