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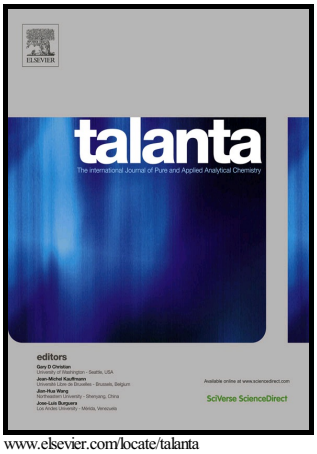

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Detection of hemoglobin using hybrid molecularly imprinted polymers/carbon quantum dots-based nanobiosensor prepared from surfactant-free Pickering emulsion

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Abstract

A simple fluorescent nanobiosensor based on molecularly imprinted polymers (MIPs) and carbon quantum dots (CQDs) was developed for hemoglobin (Hb) detection. The nanocomposites were synthesized by a novel one-pot surfactant-free Pickering emulsion method, in which imprinted cavities complementary to Hb were formed at the surface of the particles for target recognition, while CQDs were incorporated in the core as the fluorescence probe. We innovatively used the Hb template as emulsifier to help stabilize the emulsion droplets. The method eliminated the need of surfactant, which greatly simplified Pickering emulsion synthesis procedures, and significantly enhanced the fidelity of molecular imprinting. Moreover, the method provided an easy way to integrate fluorescent probes with MIPs in a single step. The nanobiosensor was utilized for determination of Hb via fluorescence quenching, and high selectivity and sensitivity were achieved. Under the optimized conditions, a linear range of 0.77-7.7 nM and a detection limit of 0.77 nM were obtained. The resulting nanocomposites were also successfully applied to detect Hb in the serum samples, which showed good recoveries ranging from 86.8% to 93.9%.

Graphical abstract