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Sensitive fluorescent detection of H_2O_2 and glucose in human serum based on inner filter effect of squaric acid-iron(Ⅲ) on the fluorescence of upconversion nanoparticle

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Abstract

Diabetes mellitus is an epidemic disease that it has became a worldwide public health problem. Thus, blood glucose monitoring has attracted extensive attention. Here, we report a nanosensor based on inner filter effect (IFE) between upconversion nanoparticles (UCNPs) and squaric acid (SQA)-iron(III) for the highly sensitive and selective detection of glucose levels in human serum. In this assay, GOx-catalyzed oxidization of glucose produces gluconic acid and hydrogen peroxide (H_2O_2). The latter can catalytically oxidize iron(II) to iron(III) which can rapidly (<1 min) coordinate with the SQA to produce (SQA)-iron(III). The absorption band of (SQA)-iron(III) largely covered the emission band of UCNPs, resulting the fluorescence emission of UCNPs was effectively quenched. Therefore, the glucose can be monitored based on the formation of SQA-iron(III). Under the optimal condition, the fluorescence quenching efficiency shows a good linear response to glucose concentration in the ranges of 7-340 μM with a detection limit of 2.3 μM. The developed method has been further applied to monitor glucose levels in human serum with satisfactory results. Compared with other fluorescence methods, current method displayed

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