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One-step synthesis of enzyme-stabilized Gold Nanoclusters for fluorescent ratiometric detection of hydrogen peroxide, glucose and uric acid

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Abstract: This paper reports a novel enzyme-functionalized gold nanocluster with dual emission characteristics. We applied the reductivity of tyrosine residues in catalase to reduce gold ions so as to fabricate catalase conjugated gold nanoclusters (CAT-GNCs) under strong alkaline conditions. The whole synthetic process only took 15 min. We observed the fluorescence of CAT-GNCs can be rapidly quenched by hydrogen peroxide, which indicates that the activity of catalase was not severely affected although it was used as reductant in the synthesis of the CAT-GNCs. The CAT-GNCs were used as a ratiometric fluorescence sensor to detect H₂O₂, and the linear range was 10-80 μM (R² = 0.9939). The detection limit was as low as 25 nM. The CAT-GNCs were also used to determine the glucose and uric acid, with the linear ranges of 5-500 μM (R² = 0.9938) and 10-200 μM (R² = 0.9910), respectively; and the detection limits of 3 μM and 40 nM, respectively. Finally, the CAT-GNCs were used in real serum samples, the recovery rates of the glucose and UA were more than 86.37% and 86.90%, respectively. The results demonstrated that the CAT-GNCs have the potential for use.

Keywords: Catalase, GNCs, hydrogen peroxide, glucose, Uric acid

1. Introduction

Enzymes are special proteins with high selectivity and catalytic activity, which makes them to play an outstanding role in biological metabolic systems and important reagents for qualitative or quantitative analysis ^[1]. In recent years, researchers have carried out a new

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