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Authors: Na Wang, Ying Liu, Yuhang Li, Qin Liu, Minqian Xie



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Fluorescent and colorimetric sensor for Cu^{2+} ion based on formaldehyde modified hyperbranched polyethylenimine capped gold nanoparticles

Na Wang*, Ying Liu, Yuhang Li, Qin Liu, and Minqian Xie

College of Chemistry and Chemical Engineering, Southwest Petroleum University, Chengdu 610500, Sichuan, PR China

*Corresponding author. Tel: +86 028 8303 7341

Fax: +86 028 8303 7305

E-mail address: wangna@swpu.edu.cn

Highlights

- The polyethylenimine capped gold nanoparticles are synthesized by one-pot method.
- Cu^{2+} ion can be determined by both of the fluorescence and colorimetry strategy based on the sensors.
- The quantized limit of detection (LOD) of this sensor is 77 nM.
- The fluorescence of the sensor originates from formaldehyde modified polyethylenimine.

Abstract

In this paper, we propose a fluorescent and colorimetric sensor for Cu^{2+} ion based on formaldehyde modified hyperbranched polyethylenimine capped gold nanoparticles (F-hPEI Au NPs). The fluorescent sensor is prepared by one-pot synthesis, of which the fluorescence intensity could be quenched by Cu^{2+} ion. The response behavior of the sensor is dependent on the pH value of the solution. At pH 4.0, the sensor exhibits a linear response for Cu^{2+} ion over a wide concentration range of 0.15 μM – 23 μM . The detection limit for the sensor is estimated to be 77 nM ($\text{S/N}=3$), and the precision for five replication detections of 2.0 μM Cu^{2+} ion is 4.7% (relative standard deviation). Both the color and fluorescence intensity of the sensor change obviously and could be observed with the

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