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M. Reza Hormozi-Nezhad, Samira Abbasi-Moayed



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## A sensitive and selective colorimetric method for detection of copper ions based on anti-aggregation of unmodified gold nanoparticles

M. Reza Hormozi-Nezhad <sup>a,b,\*</sup> and Samira Abbasi-Moayed

<sup>a</sup> Department of Chemistry, Sharif University of Technology, Tehran 11155-9516, Iran

<sup>b</sup> Institute for Nanoscience and Nanotechnology, Sharif University of Technology, Tehran, Iran

\*Corresponding author:

Address: Department of Chemistry, Sharif University of Technology, Tehran 11155-9516, Iran

Tel.: +98 2166165337; Fax: +98 2166029165

E-mail address: hormozi@sharif.edu (M.Reza Hormozi-Nezhad)

### Abstract

A highly sensitive and selective colorimetric method for detection of copper ions, based on anti-aggregation of D-penicillamine (D-PC) induced aggregated gold nanoparticles (AuNPs) was developed. Copper ions can hinder the aggregation of AuNPs induced by D-PC, through formation of mixed-valence complex with D-PC that is a selective copper chelator. In the presence of a fixed amount of D-PC, the aggregation of AuNPs decreases with increasing concentrations of  $\text{Cu}^{2+}$  along with a color change from blue to red in AuNPs solution and an increase in the absorption ratio ( $A_{520}/A_{650}$ ). Under the optimum experimental conditions (pH 7,  $[\text{AuNPs}] = 3.0 \text{ nmol.L}^{-1}$  and  $[\text{NaCl}] = 25 \text{ mmol.L}^{-1}$ ), a linear calibration curve for  $\text{Cu}^{2+}$  was obtained within the range of  $0.05\text{-}1.85 \mu\text{mol.L}^{-1}$  with a limit of detection ( $3S_b$ ) of  $30 \text{ nmol.L}^{-1}$ . Excellent selectivity toward  $\text{Cu}^{2+}$  was observed among various metal ions due to a specific complex formation between  $\text{Cu}^{2+}$  and D-PC. The proposed method has been successfully applied for the detection of  $\text{Cu}^{2+}$  in various real samples.

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