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Selective colorimetric analysis of spermine based on the cross-linking aggregation of gold nanoparticles chain assembly

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Abstract

A selective colorimetric assay for spermine was proposed in this work. In a weak alkaline medium, the conformational structure of double-stranded calf thymus DNA (ctDNA) was loosened to install gold nanoparticles (AuNPs) into chains. While, the chain assembly of AuNPs could form cross-linking aggregates when spermine was present, which was attributed to the electrostatic interaction between the positive change of spermine and negative change both of AuNPs and ctDNA, as well as the groove binding between ctDNA and spermine. Under the optimum conditions, the aggregation degree of AuNPs was proportional to the concentration of spermine in the range of 0.1-2.0 μM with a limit of detection of 11.6 nM. More interestingly, AuNPs changed from red to purple and even to blue depending on the concentration of spermine, which could be developed for the colorimetric analysis of spermine. ctDNA-AuNPs assembly was demonstrated as a novel visual probe for the specific sensing of spermine with high specificity and sensitivity.

Keywords: gold nanoparticles; spermine; assembly; cross-linking aggregation.

1. Introduction

Owing to the unique properties, gold nanoparticles (AuNPs) have opened up broad

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