OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference on
Nanotek and Expo

December 3-5, 2012 DoubleTree by Hilton Philadelphia Center City, USA

Robust one pot synthesis of colloidal silver nanoparticles by simple REDOX method and absorbance recovered sensing

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Conventional synthesis of silver nanoparticles employs a reducing agent and a capping agent. In this report water-soluble silver nanoparticles (AgNPs) were prepared facilely by chemical reduction of Ag (I) ions. 4-Amino-3-(D-gluco-pentitol-1-yl)-4, 5-dihydro-1,2,4-triazole-5-thione (AGTT) was used both as reducing and stabilizing agent. Direct heating methodology was found to be more suitable for achieving particles with a hydrodynamic diameter of ~20 nm. AGTT exists as tautomer in solution form and our studies indicate that –NH2 group is involved in the reduction and stabilization of Ag^{+} and thione (=S) group of AGTT is possibly involved in stabilizing the nanoparticles via coordinate covalent linkage. Characterization of synthesized silver nanoparticles was performed by UV-vis, FT-IR and by FESEM. Based on the absorption properties of synthesized AgNPs, we used AgNPs to detect bovine serum albumin (BSA) and AgNPs-BSA composite nanoprobe was further applied to detect Cu^{2+} based on absorbance recovery. The proposed method has advantages over existing methods in terms of rapid synthesis and stability of AgNPs and their applications. Analysis is reproducible, cost effective and highly sensitive. The lowest detectable concentration of BSA in this approach is 3nM, and for Cu^{2+} it can detect upto 200pM.

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