Supporting Information

Detection of total count of *Staphylococcus aureus* using anti-toxin antibody labelled gold magnetite nanocomposites: a novel tool for detection, identification and bacterial separation

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Synthesis of Au seed stabilized Fe_3O_4 nanoparticles.

A 10 ml solution of EDBE-Fe_3O_4 (20 mg) suspension was first sonicated for 1 h using an ultrasonic probe with a pH 4 and then mixed with 20 ml of gold seed solution and stirred for 2 h. After 2 h of stirring, Au NPs could be electrostatically attracted onto the surface of EDBE-Fe_3O_4 NPs, leading to formation of the Au seed coated Fe_3O_4 particles as reported by Rose et al[1]. The gold seed was synthesized by mixing of a 20 mL aqueous solution containing 2.5×10^{-4} M $HAuCl_4$ and 2.5×10^{-4} M trisodium citrate. To this solution was added 0.6 mL of ice cold 0.1 M $NaBH_4$ with stirring[2]. The Au seed stabilized EDBE-Fe_3O_4 nanoparticles were magnetically separated from excess Au colloid solution and rinsed 5 times with Milli-Q water. The particle surfaces were then functionalized again with EDBE by dispersing 100 µl of EDBE solution into the gold seed stabilized EDBE-Fe_3O_4 for 4 h stirring and magnetically separated by rinsing 5 times and dispersing in 20 mL of Milli-Q water with an ultrasonic probe.

Characterizations of the nanocomposites by DLS and Zeta potential Analysis.

The Dynamic light scattering (DLS) and Zeta potential analysis of these Fe_3O_4-NH_2 and Au-Fe_3O_4 nanoparticles were further performed to monitor the formation of gold immobilized magnetite nanoparticles. After functionalization with EDBE, the particle size and zeta potential of Fe_3O_4-NH_2 was observed as 150-170 nm and +32.2 mV (table S1) at pH5

indicating that the after EDBE modification, magnetite nanoparticle achieved amenable NH_2 groups for further conjugation. After the formation of Au-Fe_3O_4 nanocomposites, the size was found to be increased than the previously obtained size of Fe_3O_4-NH_2 (200-220 nm) as well as the corresponding zeta of this gold-magnetite was decreased from highly positive value to lower negative one. This indicates that the presence of gold layer on the Au-Fe_3O_4 nanocomposites somewhat lowers the stability of these functionalized nanoparticles by increasing the agglomeration tendency between these particles.

Table S1. Hydrodynamic (HD) size, PDI and zeta potential of the EDBE-Fe_3O_4, Au-EDBE-Fe_3O_4, Antibody-Au- Fe_3O_4

Nanoparticles	Size (nm)	Zeta potential(mV)
EDBE-Fe_3O_4	160	+27.4
Au-EDBE-Fe_3O_4	220	-21.5
Antibody-Au-Fe_3O_4	315	-7.7

After antibody modification of MPA-Au-Fe3O4 nanocomposites, the particle size and surface charge of these nanoparticles was checked by DLS and Zeta potential analysis. This results indicates that the increase in size and decrease in ζ was due to the successful modification of the nanocomposites by anti-toxin antibody which significantly exhibit particle agglomeration reflecting these values.

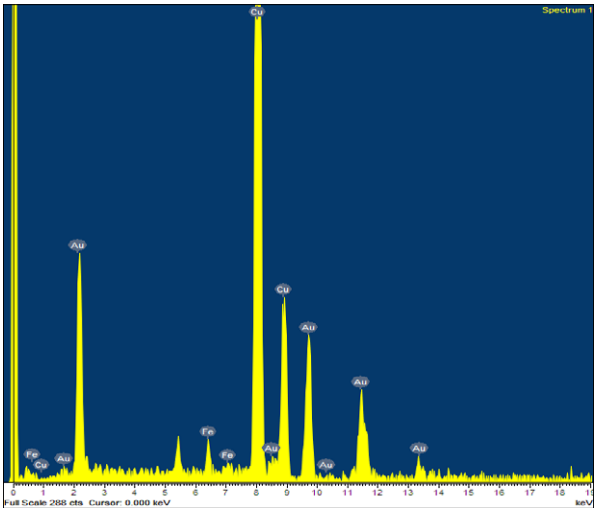

Fig. S1 EDX pattern of the Au-Fe_3O_4.

References

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