Supporting Information:

Sequential detection of Fe^{3+} and As^{3+} ions by naked eye through aggregation and dis-aggregation of biogenic gold nanoparticles

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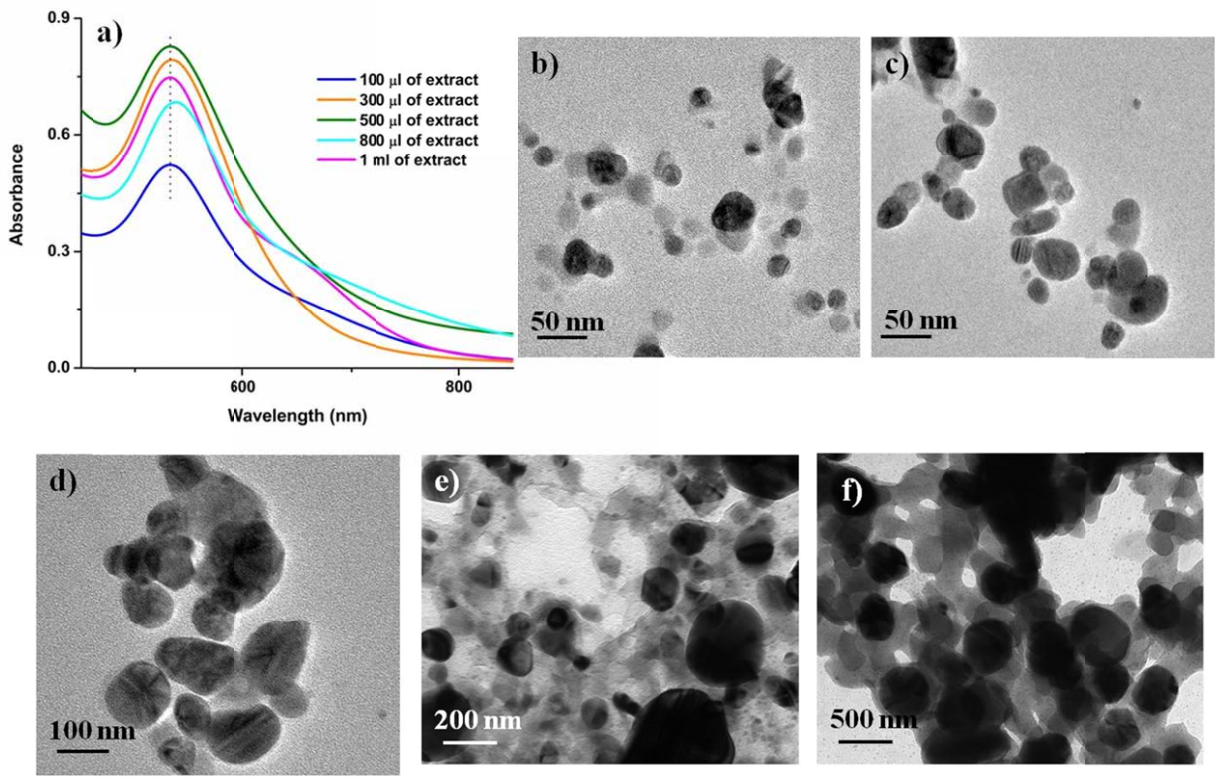

Fig. S1 a) UV-vis spectra and TEM images of AuNPs synthesized (10^{-3} M of $HAuCl_4$) with the addition of b) 100 µL, c) 300 µL, d) 500 µL, e) 800 µL and f) 1mL of peel extract.

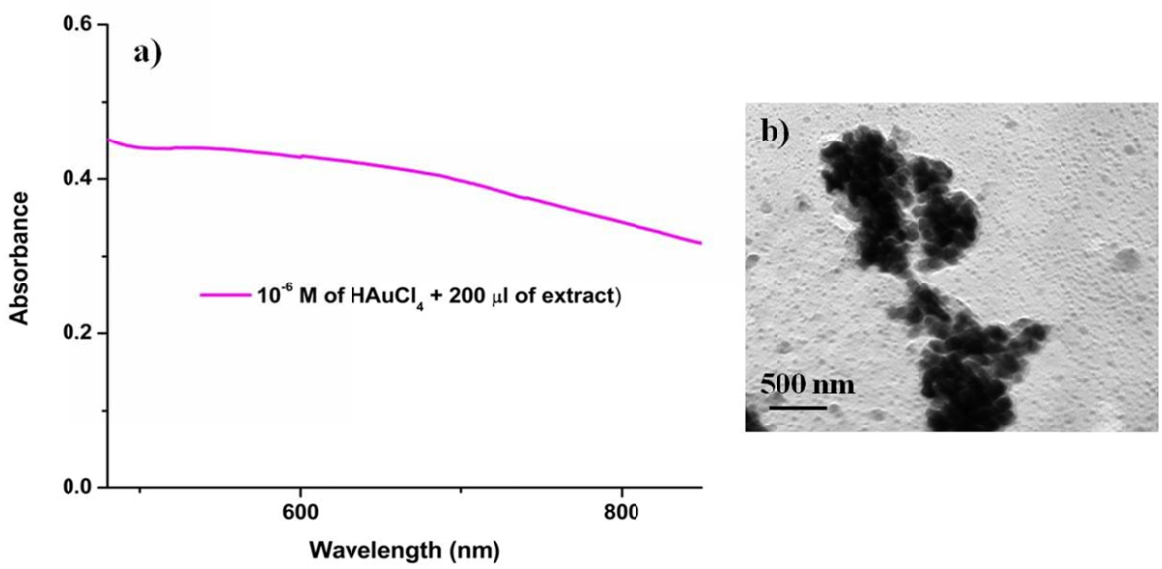

Fig. S2 a) UV-vis absorption spectrum and b) TEM image of AuNPs (200 µL of extract and 10^{-6} M $HAuCl_4$)

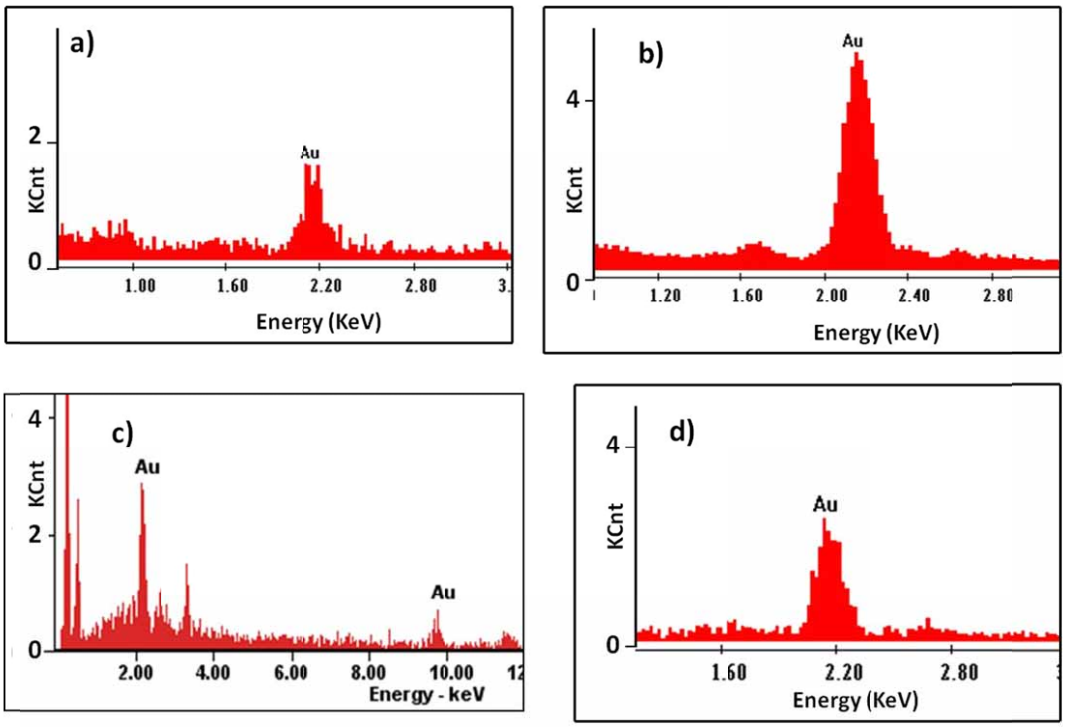

Fig. S3 EDAX profile of pomegranate peel extract stabilized a) AuNP1, b) AuNP2, c) AuNP3 and d) AuNP4.

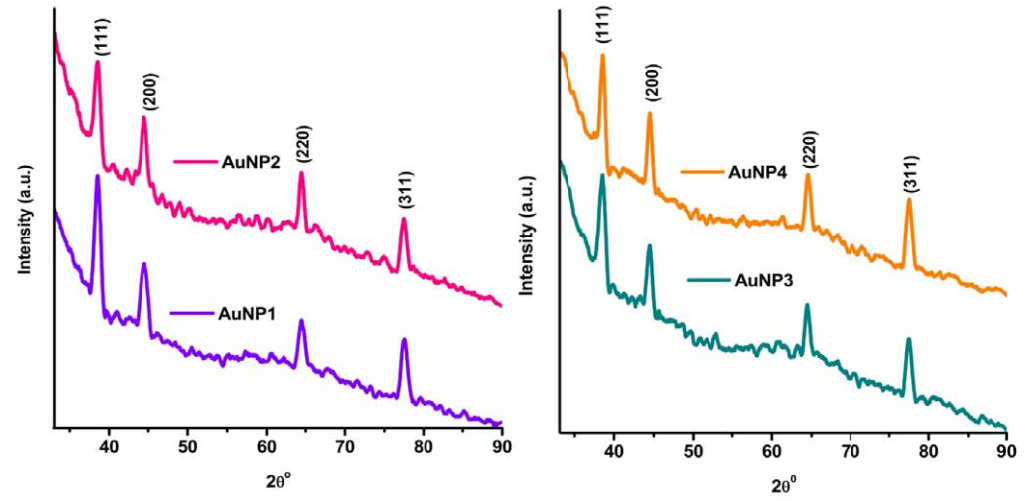

Fig. S4 XRD patterns of biosynthesized AuNPs (1-4).

Table S1 Zeta potential and size measurements of AuNPs

S. No	System	Zeta potential (mV)	Particle Size (nm)
1.	extract	-22.6	-
2.	AuNP2	-18.3	22.91
3.	AuNP3	-19.5	40.51
4.	AuNP4	-21.3	115.20

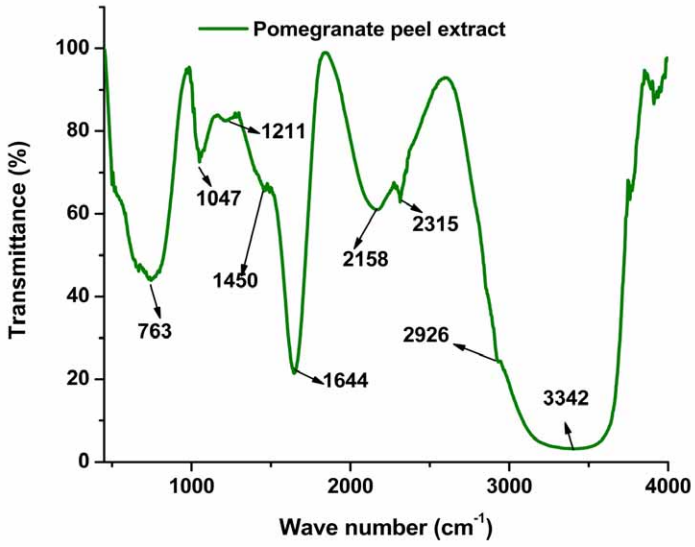

Fig. S5 FT-IR spectrum of aqueous pomegranate peel extract.

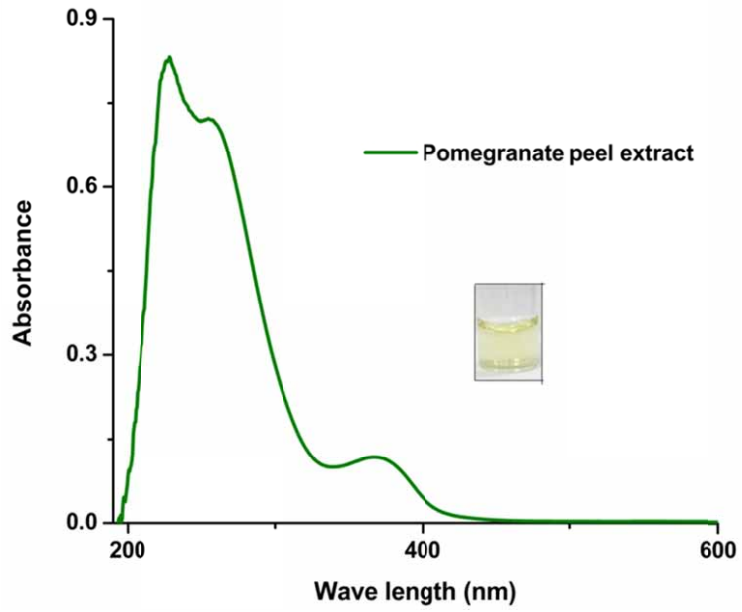

Fig. S6 UV-vis absorption spectrum of aqueous solution of pomegranate peels extract.

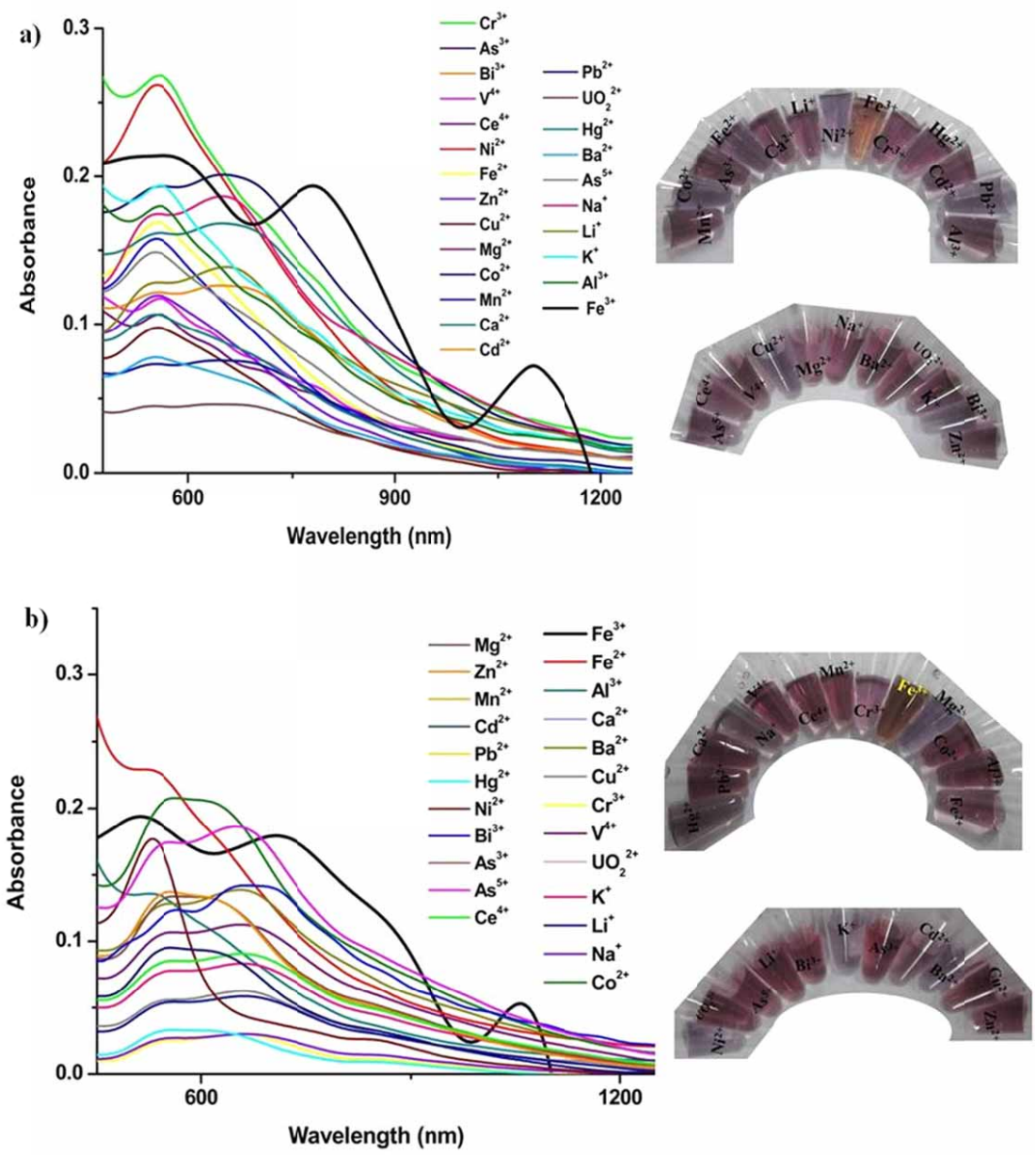

Fig. S7 UV-vis spectra of the a) AuNP1 and b) AuNP2 respectively, upon addition of different metal ions (10^{-2} M) and their corresponding photographic images (right).

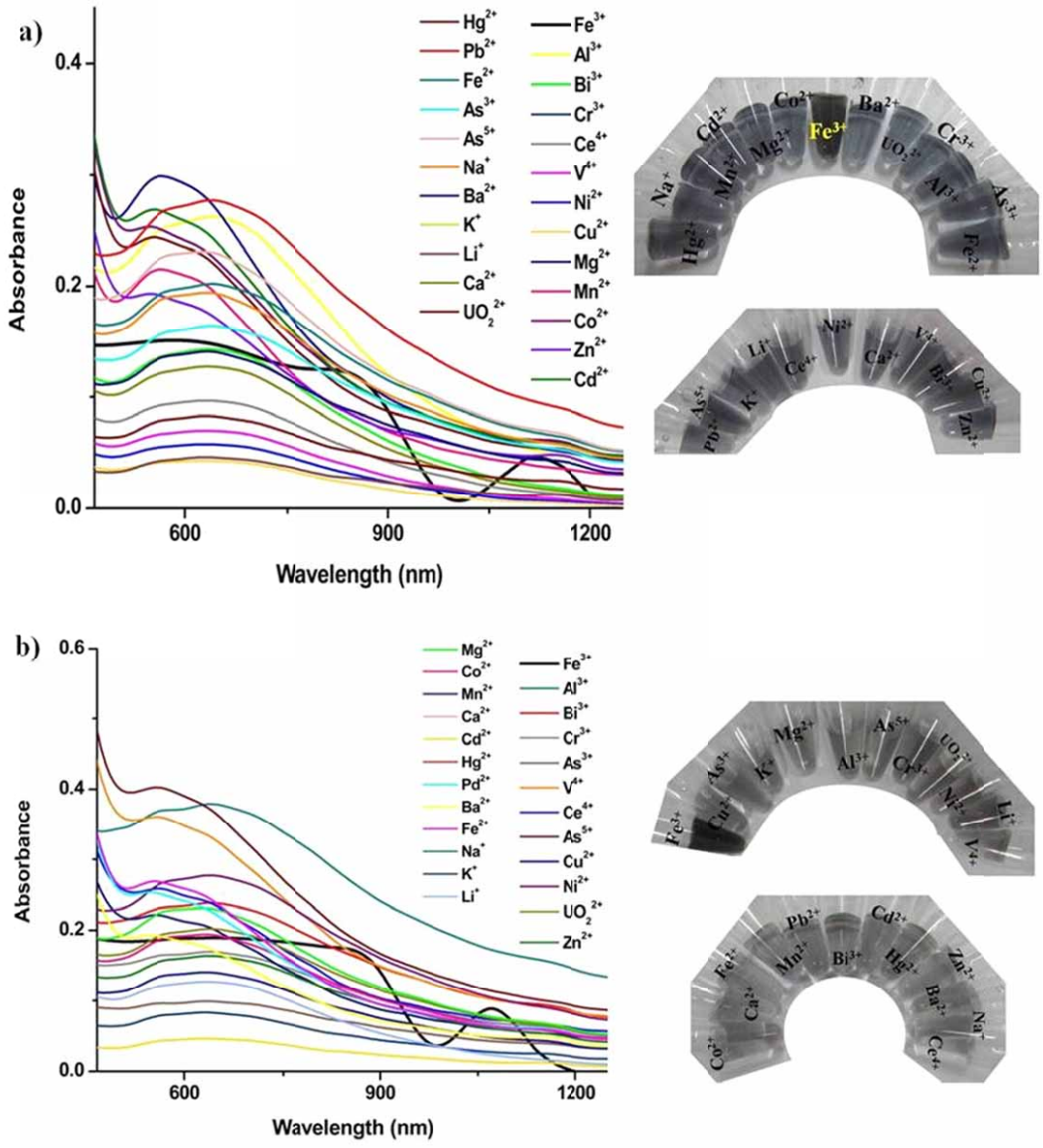

Fig. S8 UV-vis spectra of the a) AuNP3 and b) AuNP4, respectively, upon addition of different metal ions (10^{-2} M) and their corresponding photographic images (right).

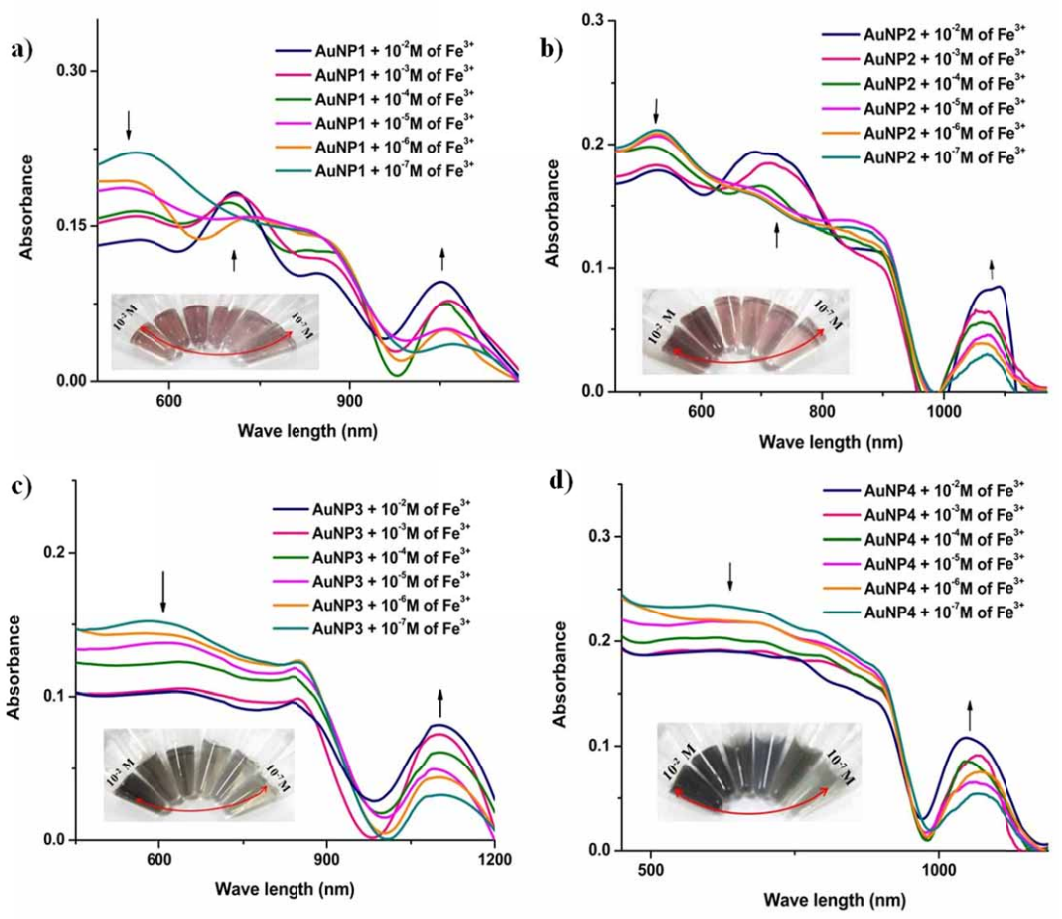

Fig. S9 UV-vis absorption spectra of AuNPs with the addition of different concentration of Fe^{3+} ions. Inset: the corresponding photographic images.

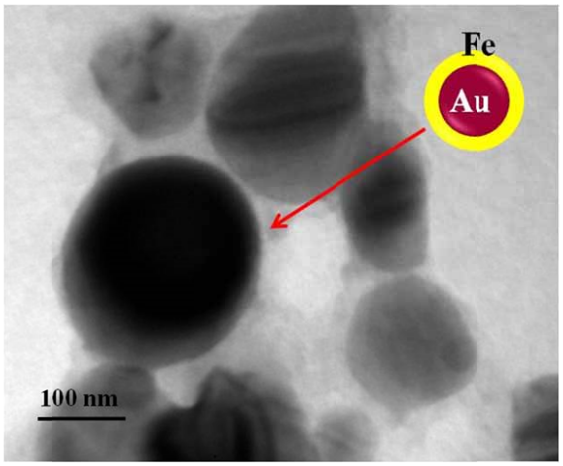

Fig. S10 TEM image shows for the formation of Fe@Au (core @ shell) NPs in the case of AuNP2 in presence of 10^{-6} M of Fe^{3+} ions.

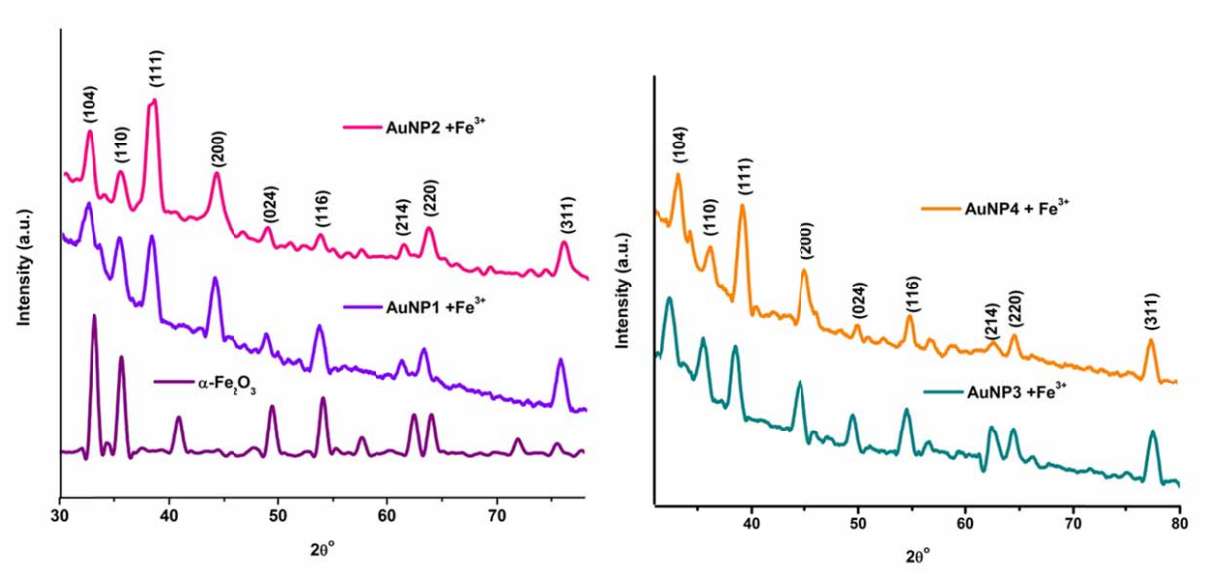

Fig. S11 XRD patterns of biosynthesized AuNPs (1-4) in presence of 10^{-6} M of Fe^{3+}.

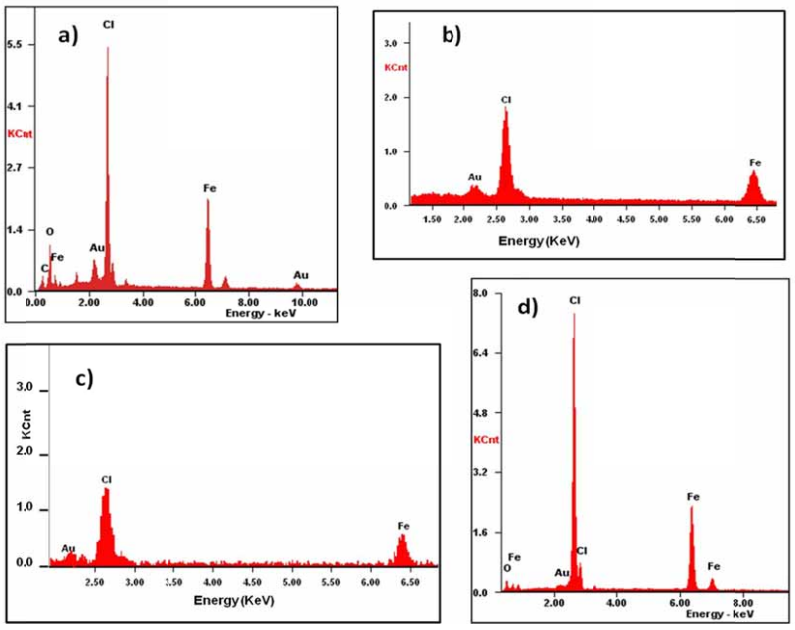

Fig. S12 EDAX profile of pomegranate peel extract stabilized a) AuNP1, b) AuNP2, c) AuNP3 and d) AuNP4 in presence of 10^{-6} M of Fe^{3+}.

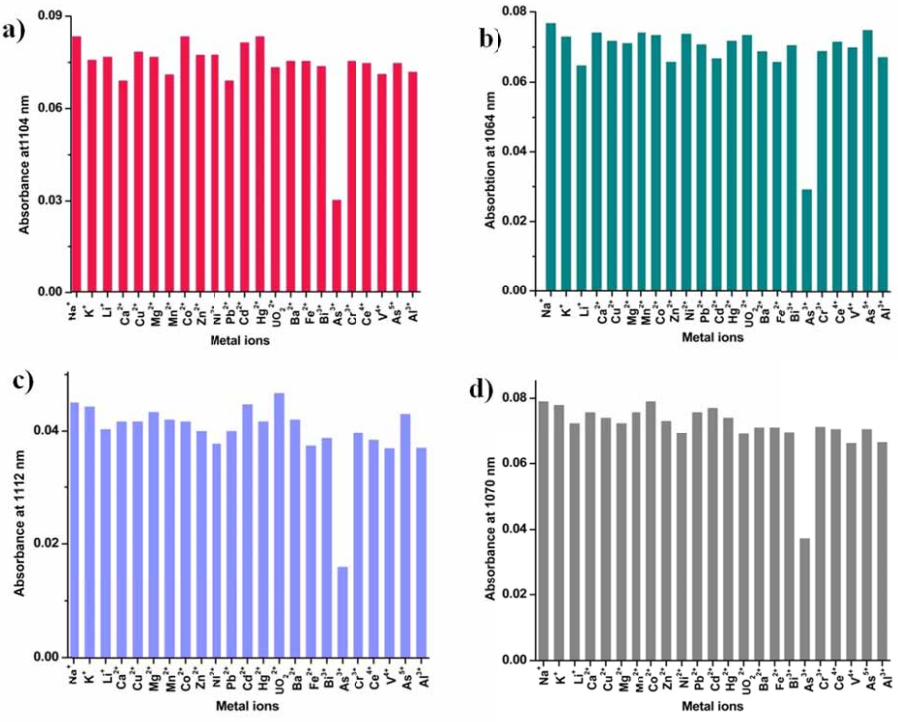

Fig. S13 Interference study of a) AuNP1 b) AuNP2 c) AuNP3 d) AuNP4 and Fe^{3+} in the presence of other metal ions (10^{-2} M).

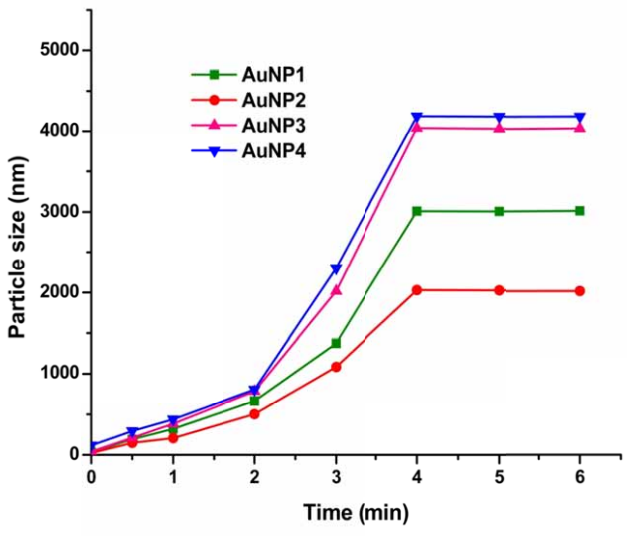

Fig. S14 Time dependent aggregation and change in particle size of AuNPs (1-4) upon addition of 10^{-6} M Fe^{3+} ions by DLS measurement.

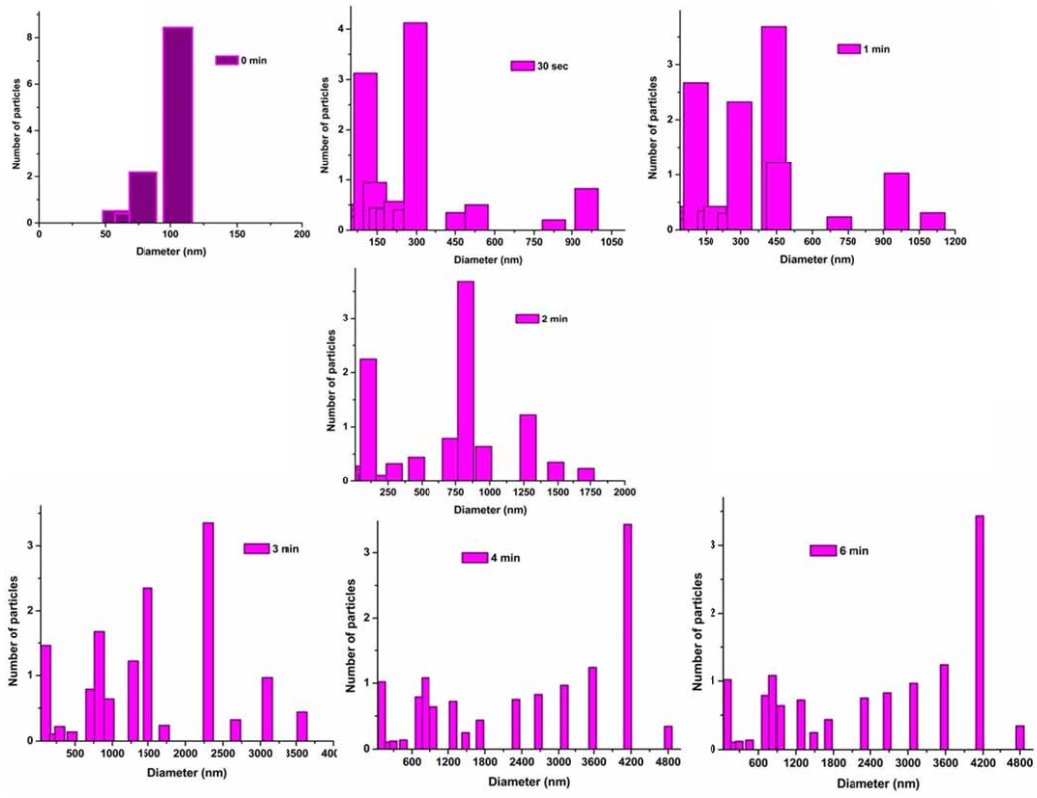

Fig. S15 Time dependent aggregation and change in particle size of AuNP4 upon addition of 10^{-6} M Fe^{3+} ions by DLS measurement.

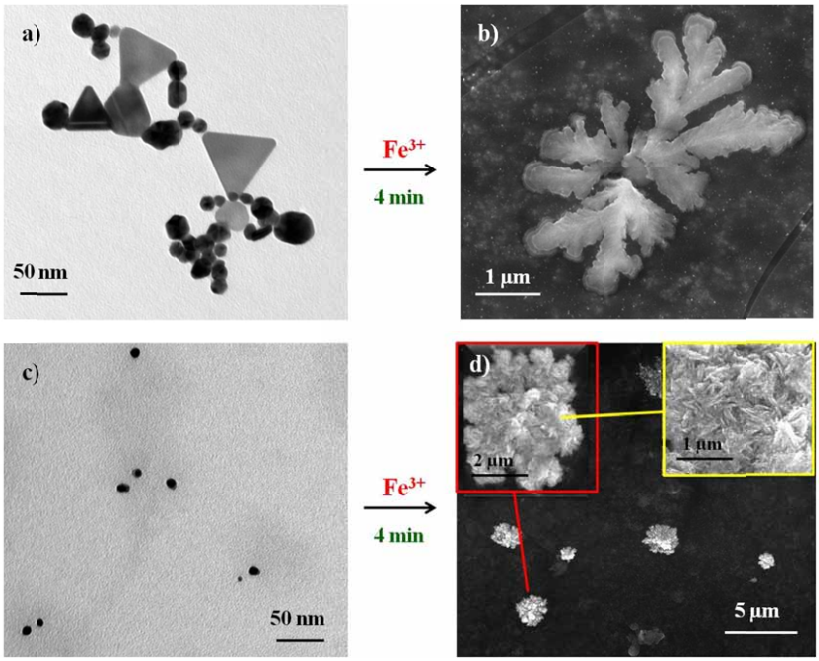

Fig. S16 TEM (a, c) and SEM (b, d) images shows the aggregation of AuNP1 (a) and AuNP2 (c) upon addition of 10^{-6} M of Fe^{3+} ions.

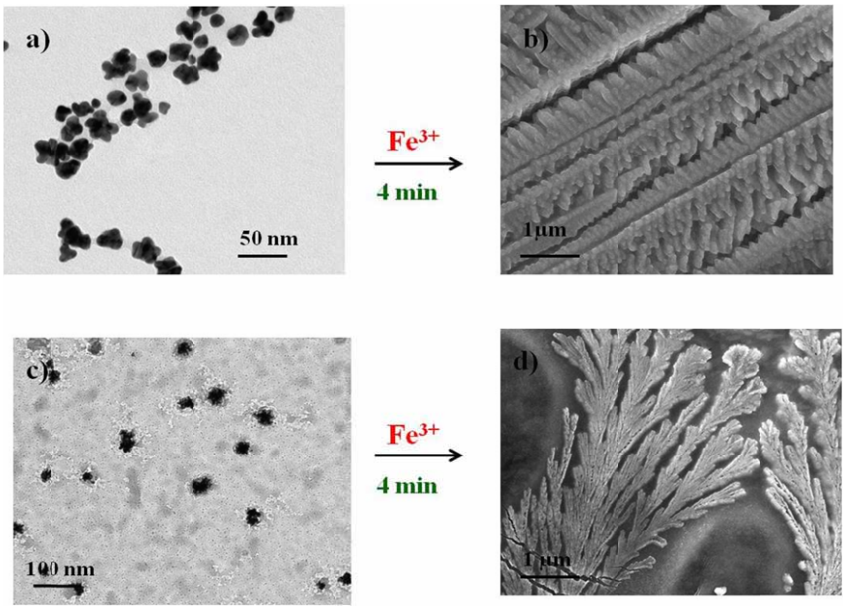

Fig. S17 TEM (a, c) and SEM (b, d) images shows the aggregation of AuNP3 (a) and AuNP4 (c) upon addition of 10^{-6} M of Fe^{3+} ions.

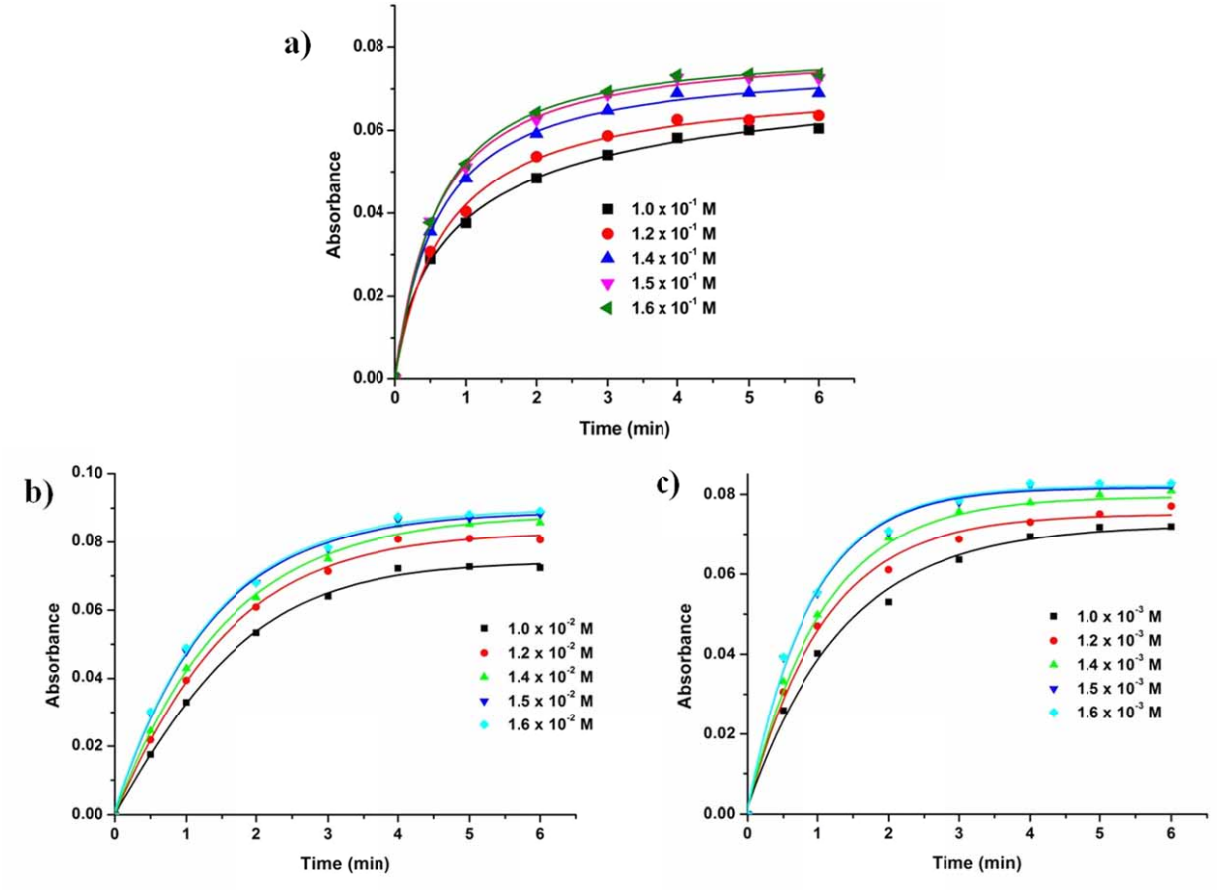

Fig. S18 *Logistic* growth fitting for time dependent aggregation of a) AuNP1, b) AuNP2 and c) AuNP3 upon addition of different concentration of Fe^{3+} ions.

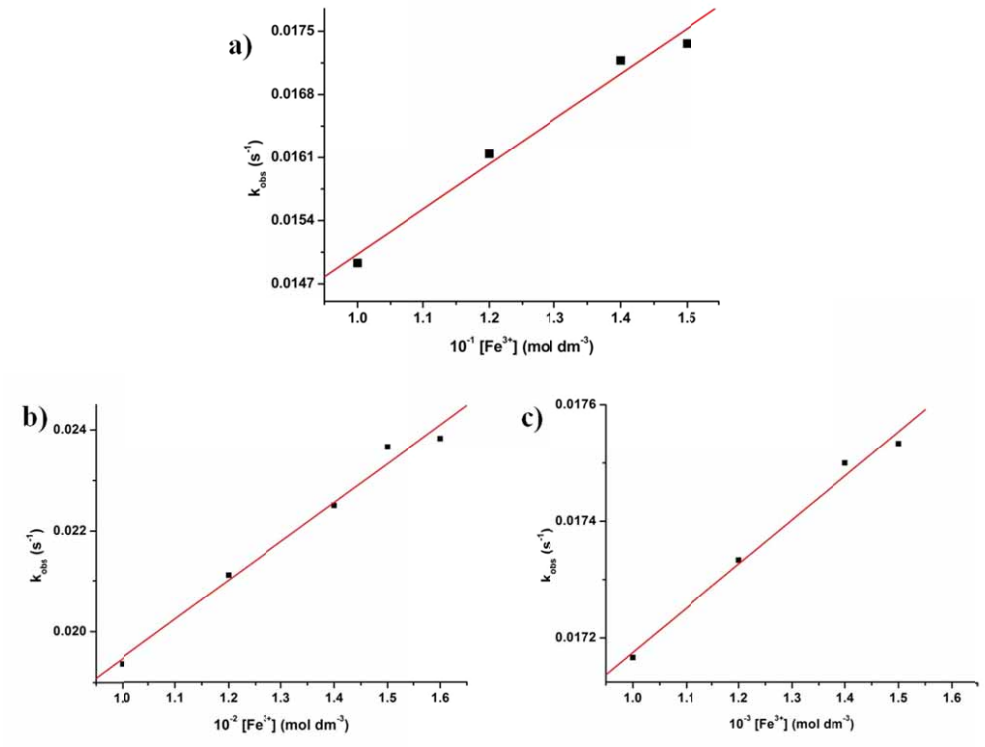

Fig. S19 Liner fitting of observed rate constant vs different concentration of Fe^{3+} ions for a) AuNP1, b) AuNP2 and c) AuNP3.

Table S2 Linear fitting data for AuNP – Fe systems

Using equation y = a + b*x in figure 19

System	Rate constant (k), s^{-1}	Standard error	R^2
Plot a*	**$5.0x10^{-3}$**	**3.8066E-4**	**0.9900**
Plot b*	**$7.7x10^{-3}$**	**5.4940E-5**	**0.9880**
Plot c*	**$7.0x10^{-4}$**	**5.8713E-5**	**0.9821**
Plot d #	**$7.0x10^{-3}$**	**6.23517E-4**	**0.9900**

(***Note*: *** = Plots (1-3) in figure S19 (a-c) and # = insect in figure 5)

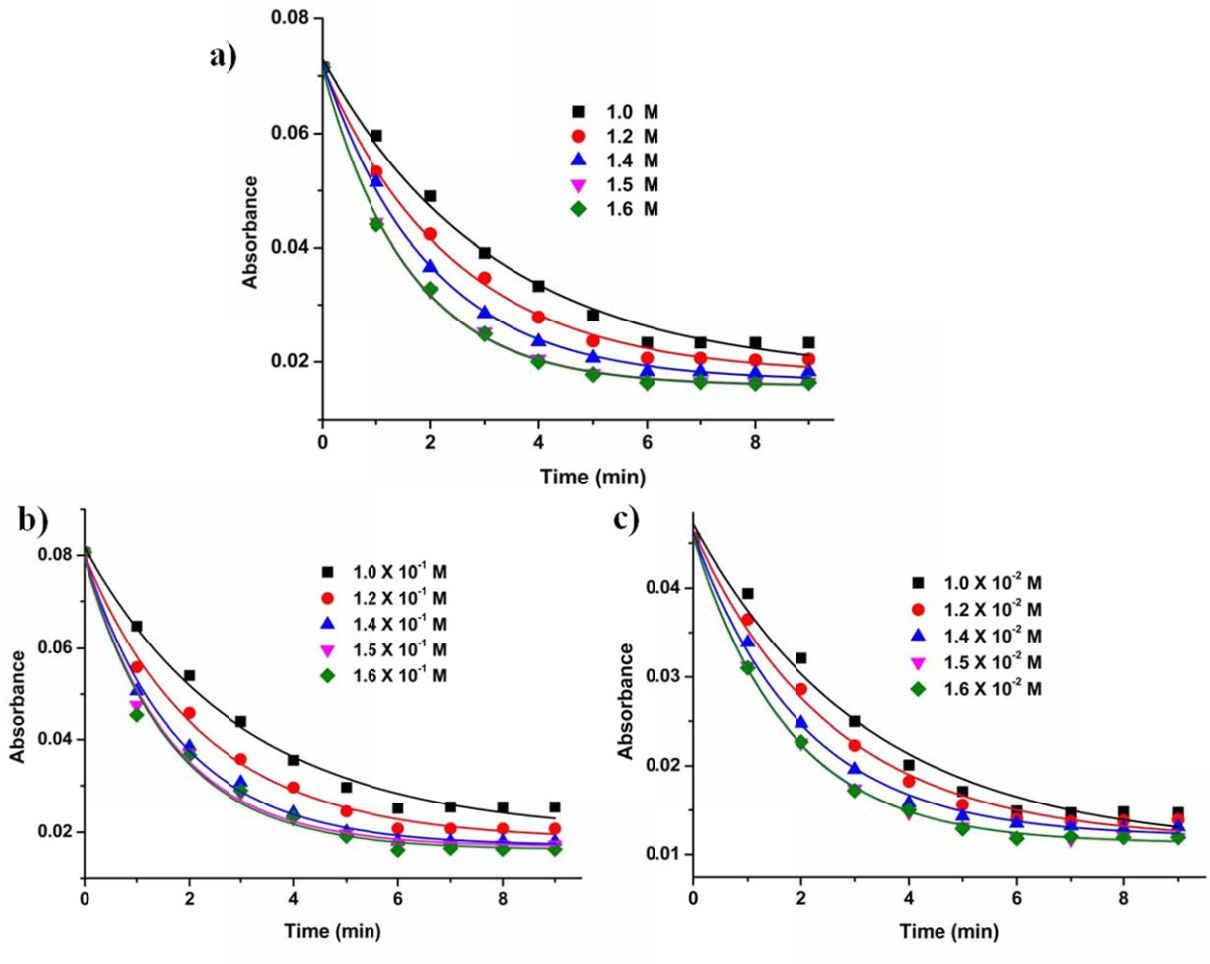

Fig. S20 Exponential decay fitting for the time dependent aggregation of a) AuNP1- Fe b) AuNP2 -Fe and c) AuNP3- Fe upon addition of different concentration of As^{3+} ions.

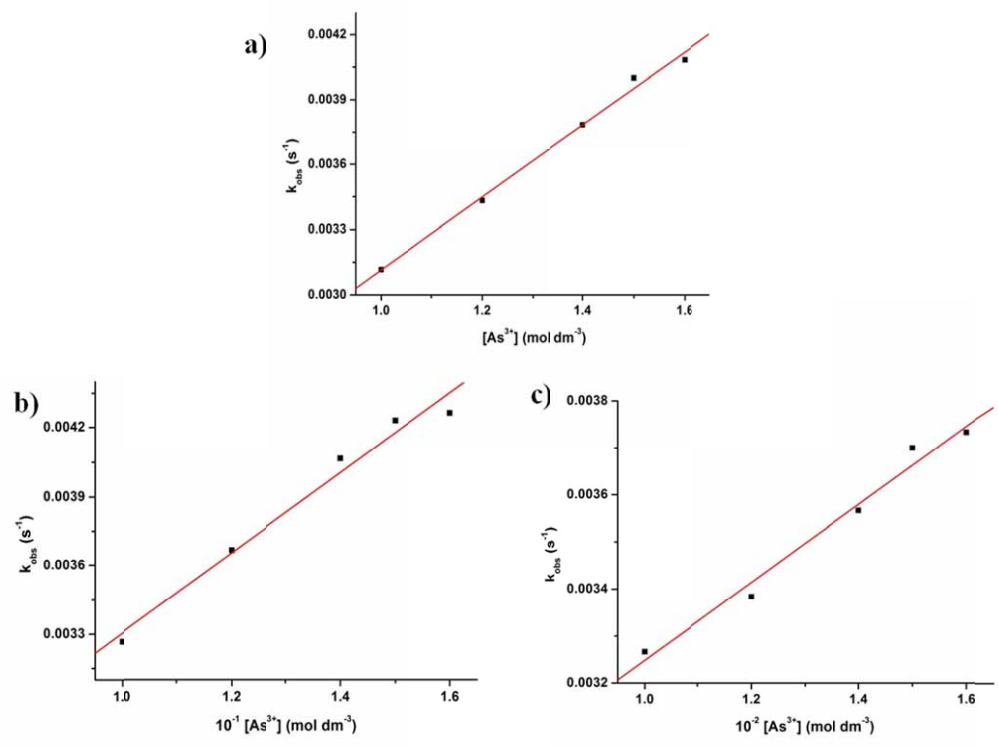

Fig. S21 Liner fitting of observed rate constant vs different concentration of As^{3+} ions for a) AuNP1-Fe, b) AuNP2-Fe and c) AuNP3-Fe.

Table S3 Linear fitting data for AuNP – Fe -As^{3+} system

Using equation y = a + b*x in figure 27

System	Rate constant (k), s^{-1}	Standard error	R^2
Plot a*	**$1.6x10^{-3}$**	**3.8066E-4**	**0.9900**
Plot b*	**$1.7x10^{-3}$**	**7.5441E-5**	**0.9880**
Plot c*	**$8.0x10^{-4}$**	**8.6997E-5**	**0.9900**
Plot d #	**$8.0x10^{-4}$**	**6.23517E-4**	**0.9900**

(***Note*: *** = Plots (1-3) in figure S27 (a-c) and # = insect in figure 7)

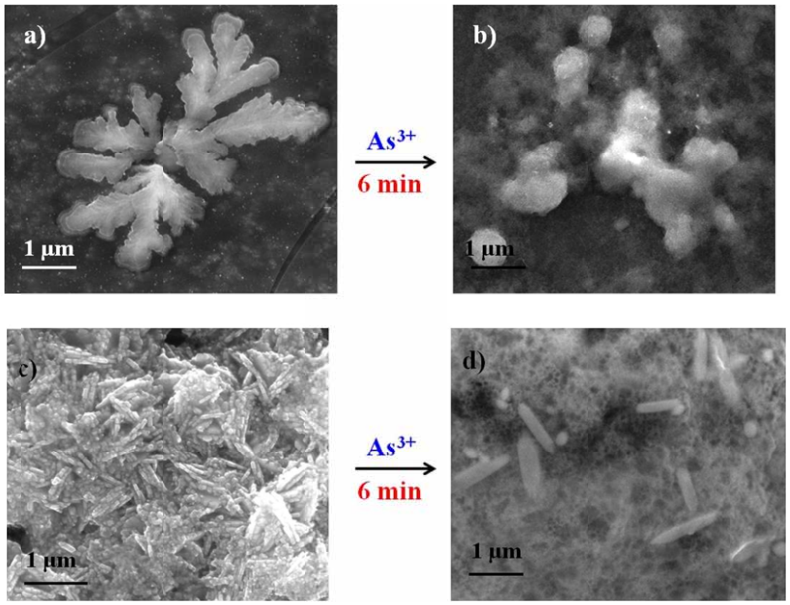

Fig. S22 SEM images showing the dis-aggregation of (a) AuNP1-Fe and (c) AuNP2-Fe upon addition of 10^{-3} M of As^{3+} ions.

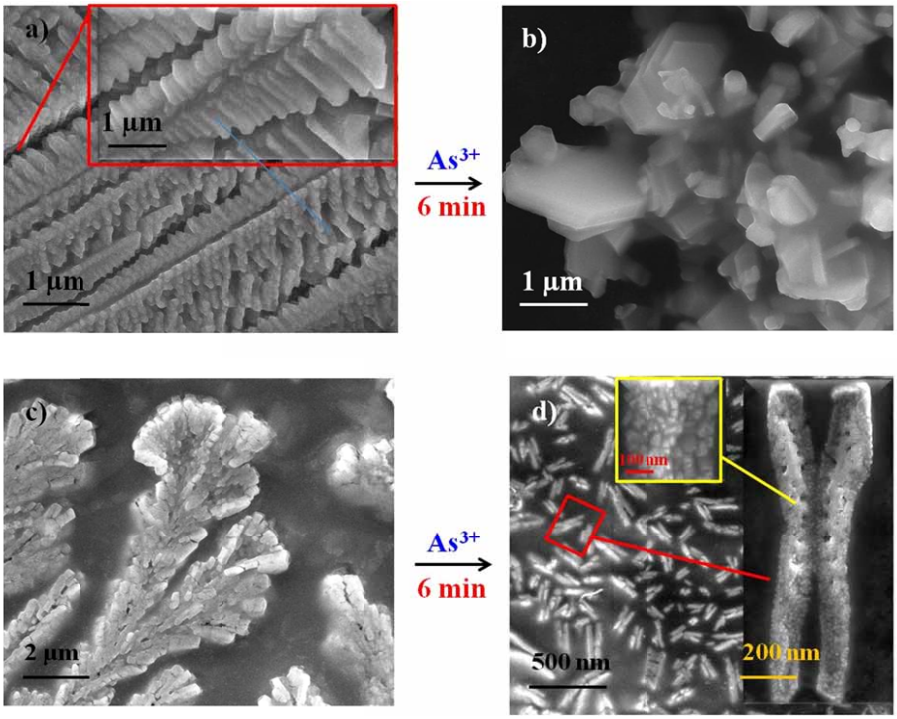

Fig. S23 SEM images showing the dis-aggregation of (a) AuNP3-Fe and (c) AuNP4-Fe upon addition of 10^{-3} M of As^{3+} ions.

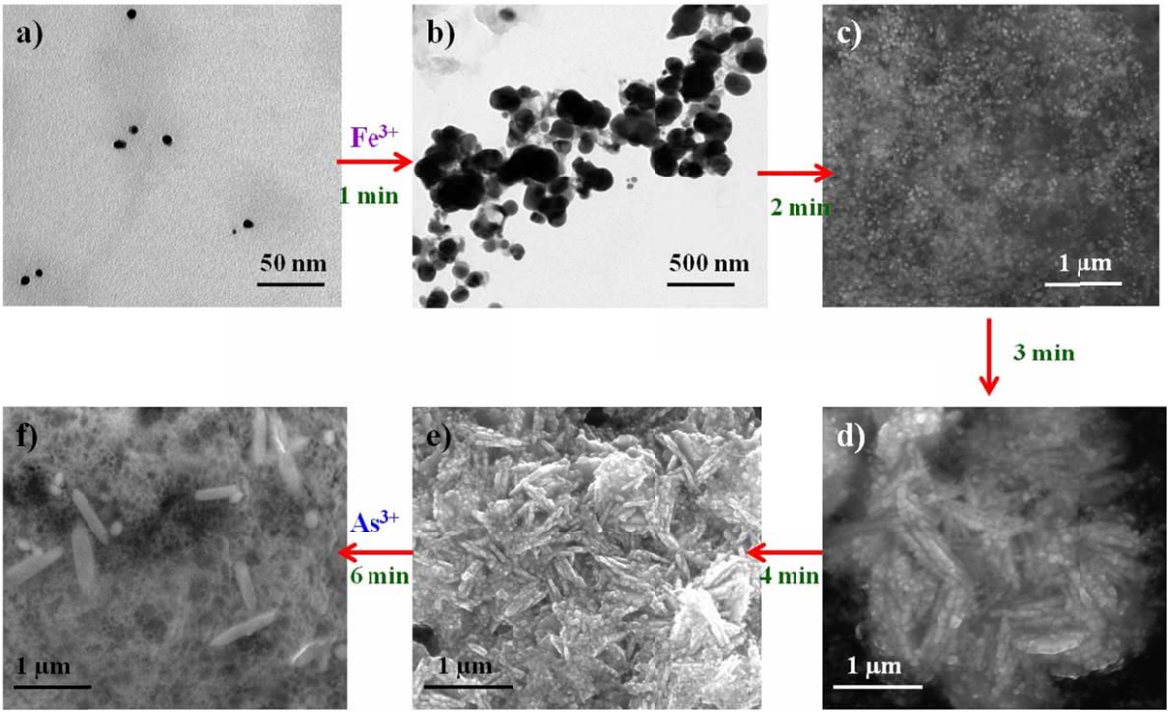

Fig. S24 TEM (a and b) and SEM (c-f) images showing the aggregation and disaggregation of AuNP1 in presence of Fe^{3+} (10^{-6} M) and As^{3+} (10^{-3} M) ions.

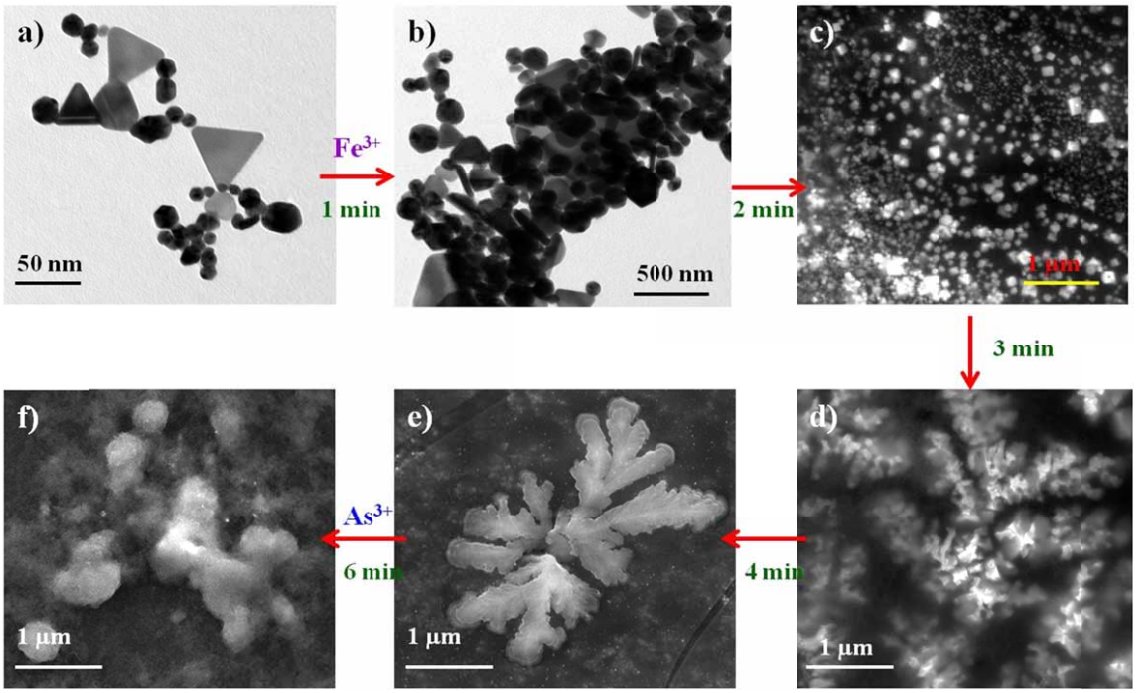

Fig. S25 TEM (a and b) and SEM (c-f) images showing the aggregation and disaggregation of AuNP2 in presence of Fe^{3+} (10^{-6} M) and As^{3+} (10^{-3} M) ions.

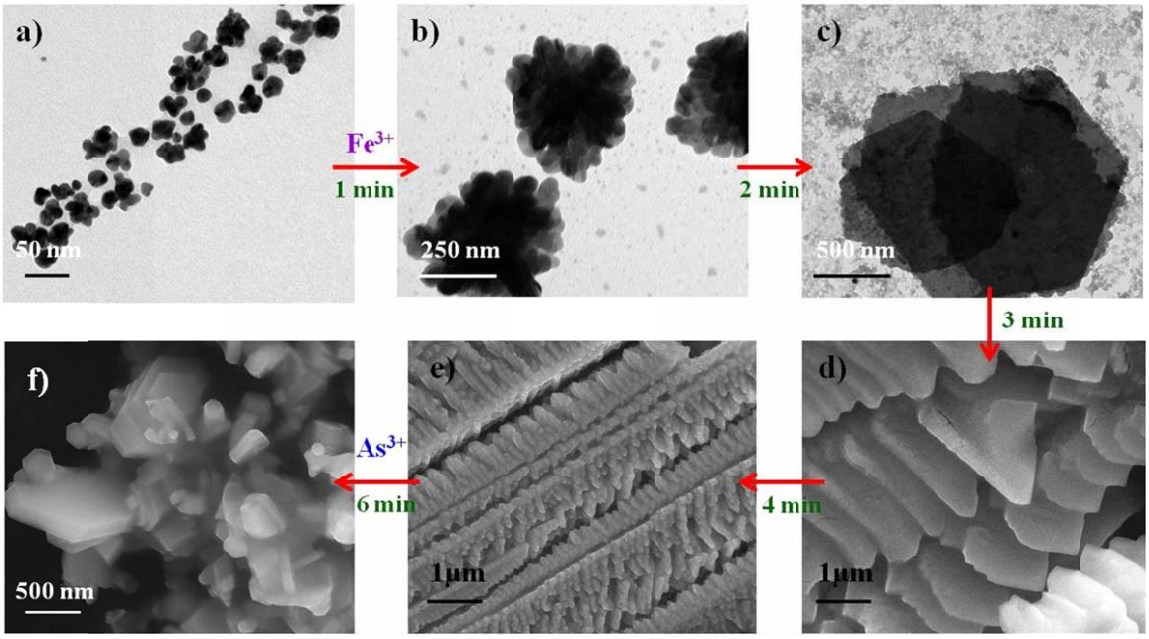

Fig. S26 TEM (a and b) and SEM (c-f) images showing the aggregation and disaggregation of AuNP3 in presence of Fe^{3+} (10^{-6} M) and As^{3+} (10^{-3} M) ions.

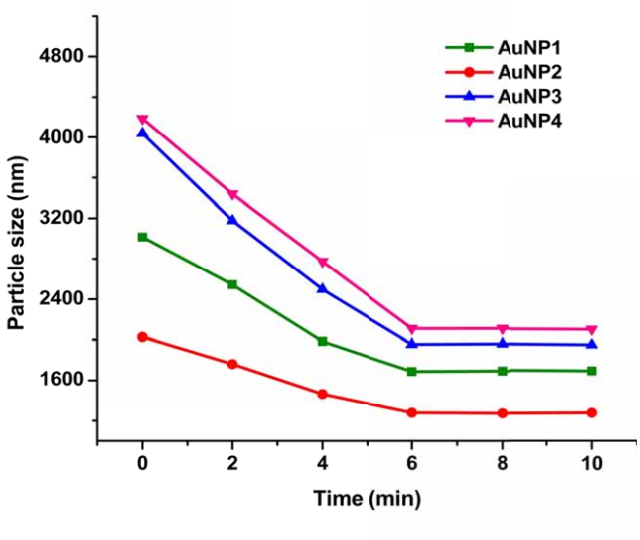

Fig. S27 Time dependent aggregation and change in particle size of AuNPs – Fe system upon addition of 10^{-3} M As^{3+} ions by DLS measurement.

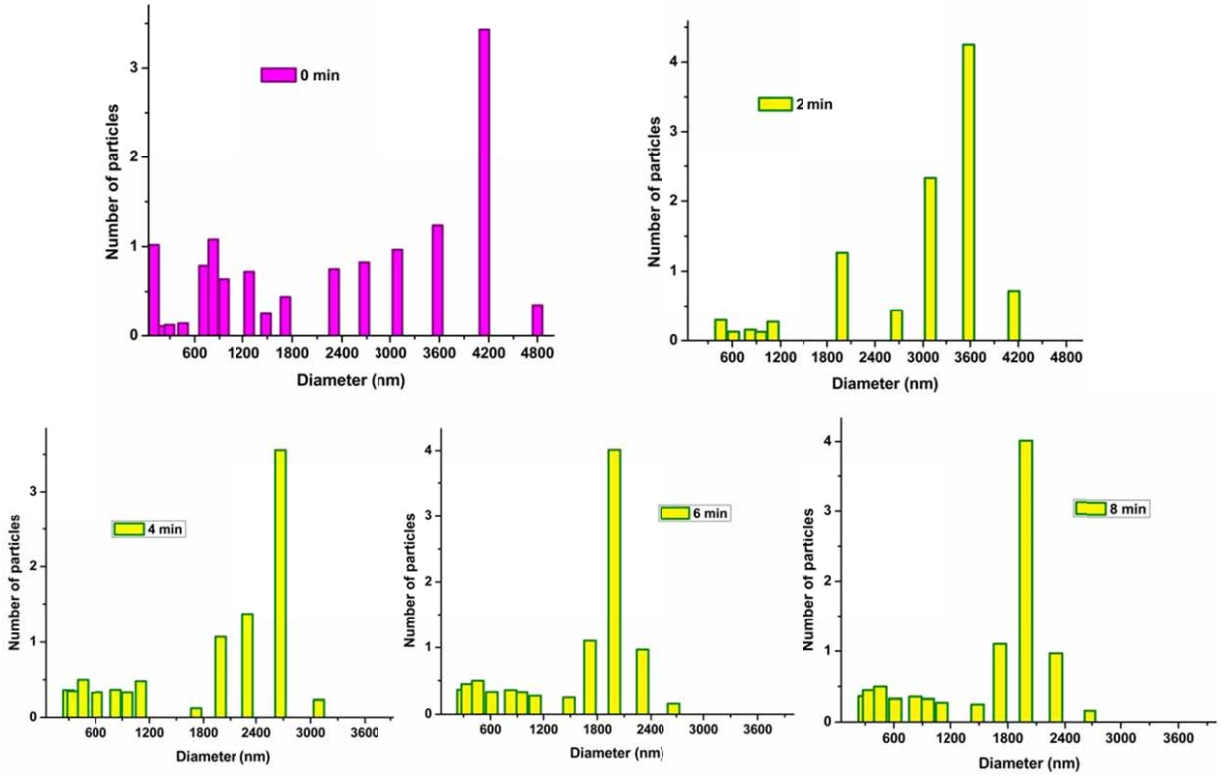

Fig. S28 Time dependent aggregation and change in particle size of AuNPs4 – Fe system upon addition of 10^{-3} M As^{3+} ions by DLS measurement.

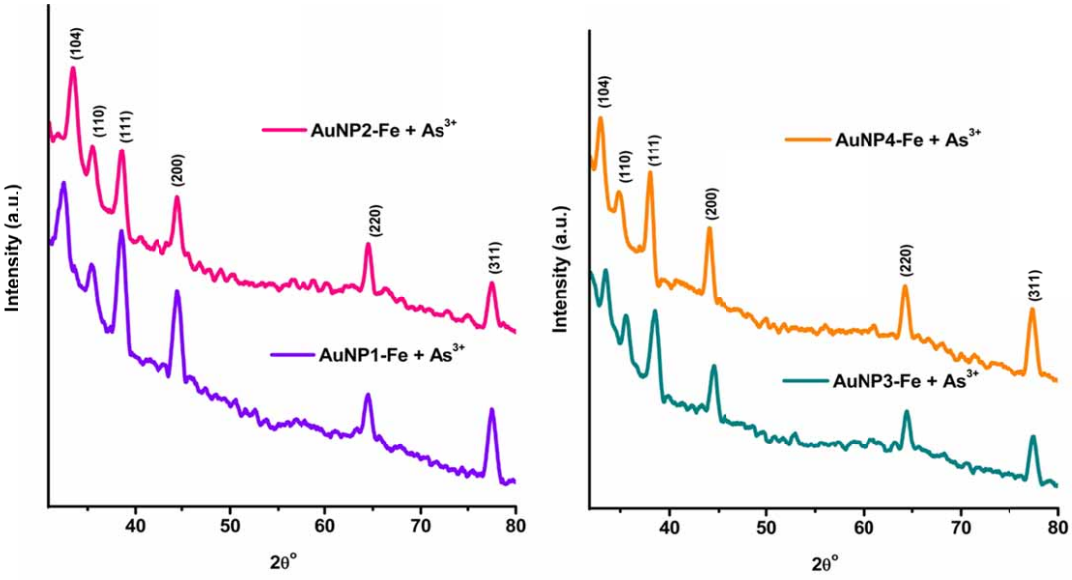

Fig. S29 XRD patterns of AuNPs-Fe system with the addition of 10^{-3} M of As^{3+}.

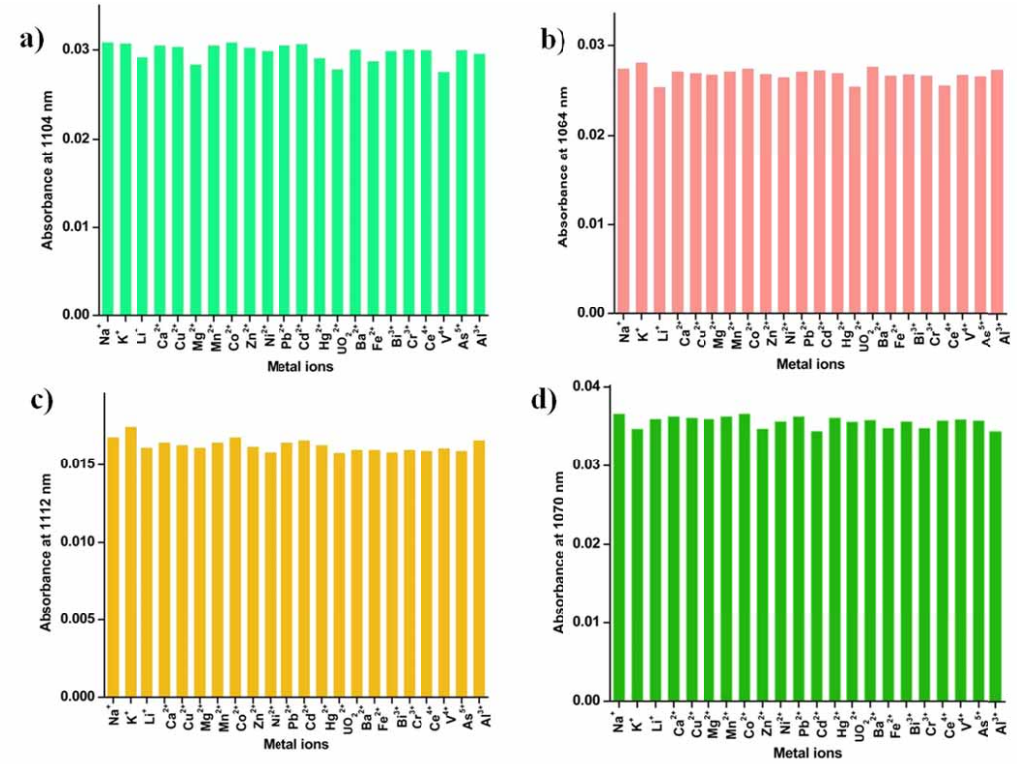

Fig. S30 Interference study of a) AuNP1-Fe b) AuNP2-Fe c) AuNP3-Fe d) AuNP4-Fe with As^{3+} in the presence of other metal ions.

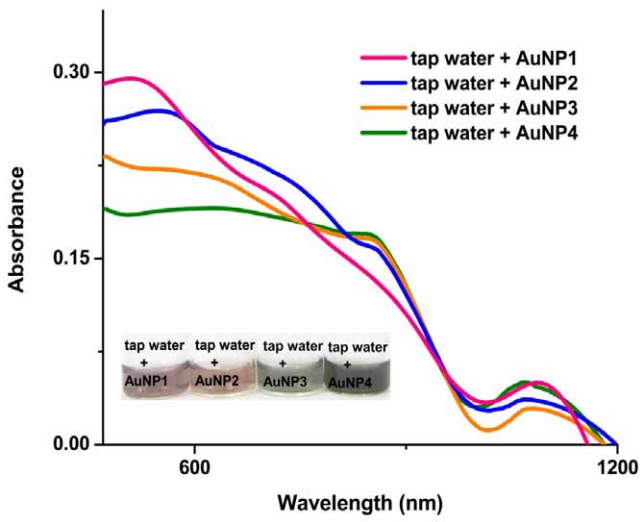

Fig. S31 UV-vis absorption spectral response of four different AuNPs system upon addition of tap water.