Supporting information

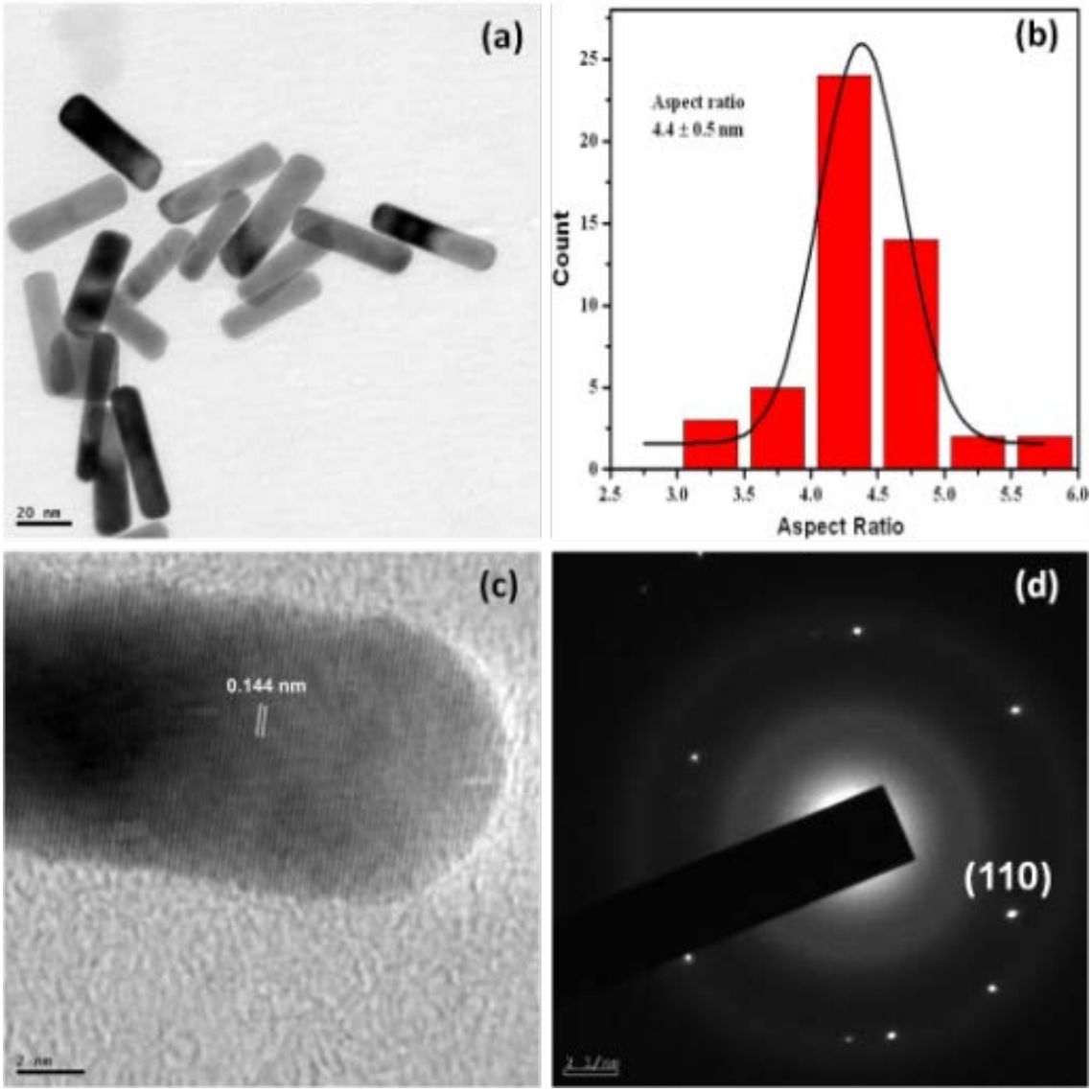


Figure S1. HRTEM images of Gold nanorods. (a) A TEM image of PSS coated Gold nanorods, (b) The aspect ratio distribution histogram of Au NRs (~50). (c) HRTEM image of a single Au NR, strongly suggest that the Au is single crystalline and grown direction along [001] direction. (d) SAED pattern of a single Au NR.

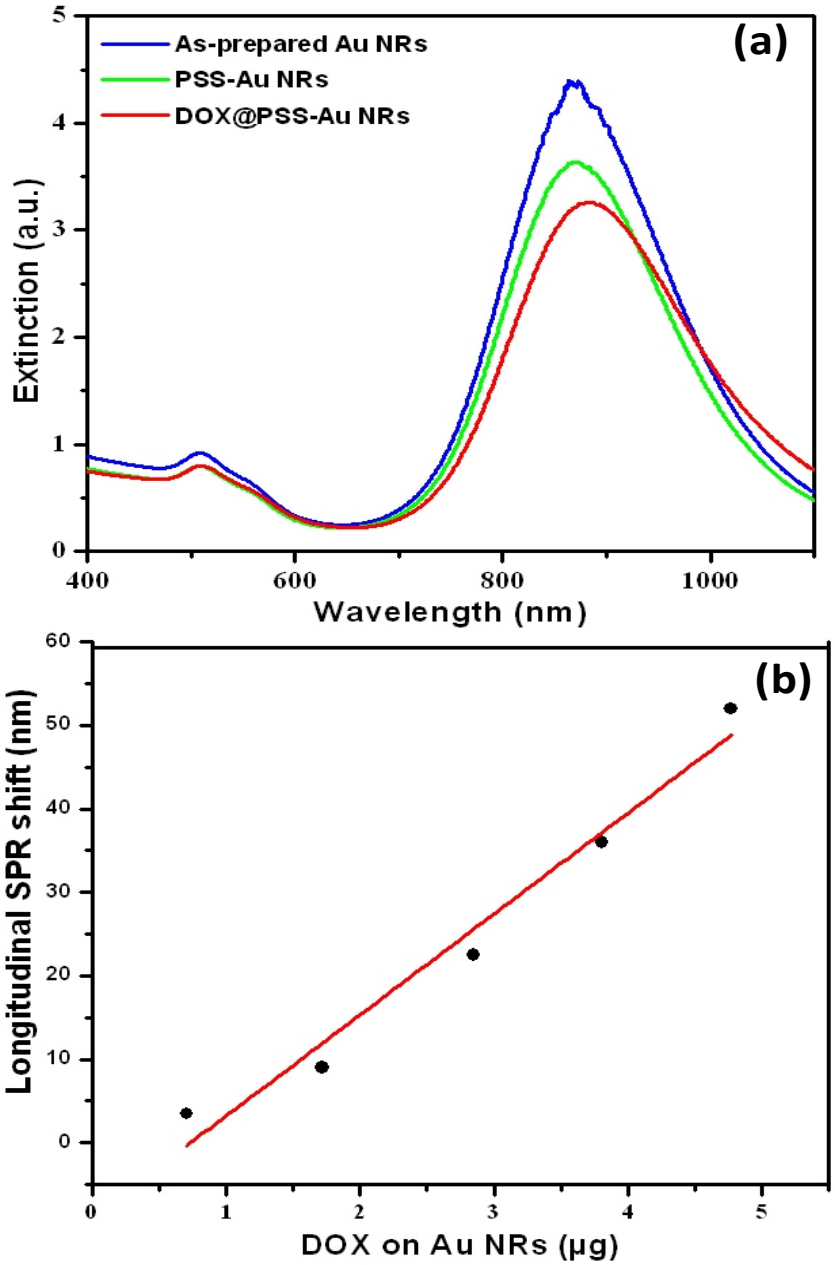


Figure S2. UV-Vis Extinction spectra of DOX@PSS- Au NRs (a) as-prepared Au NRs (Blue), PSS coated Au NRs (Green) and DOX conjugated Au NRs (Red) in aqueous solution. (b) Trends in the longitudinal SPR shift Vs. different degree of DOX conjugation on PSS-Au NRs. Linear regression was used to fit the data to a line described by the following equation: y = 12.09(x) - 8.89 (R^2=0.9626).

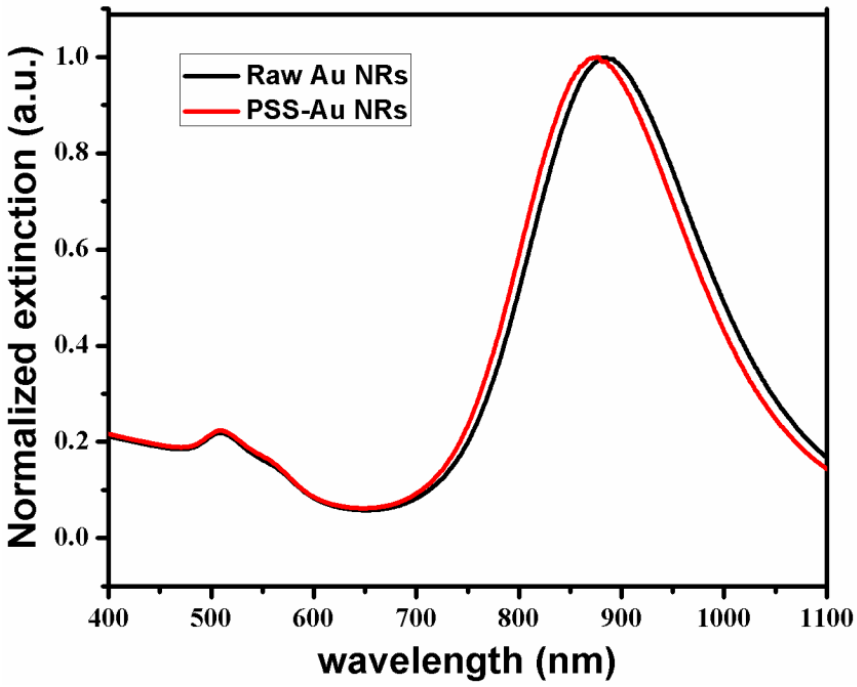


Figure S3. Extinction spectra of raw Au NRs (black) and PSS coated Au NRs (red).

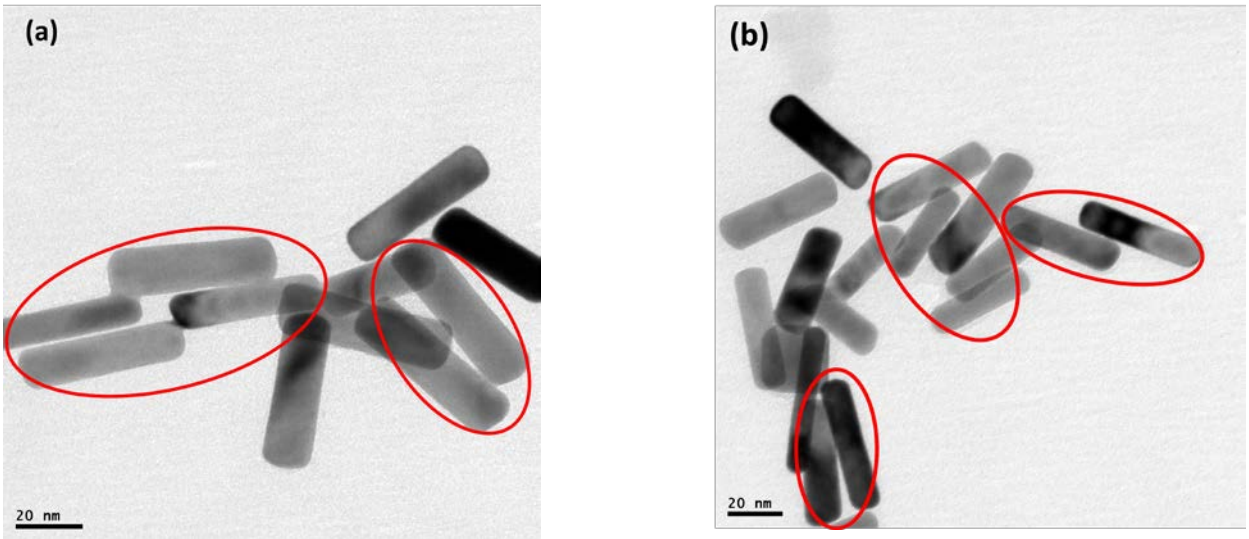
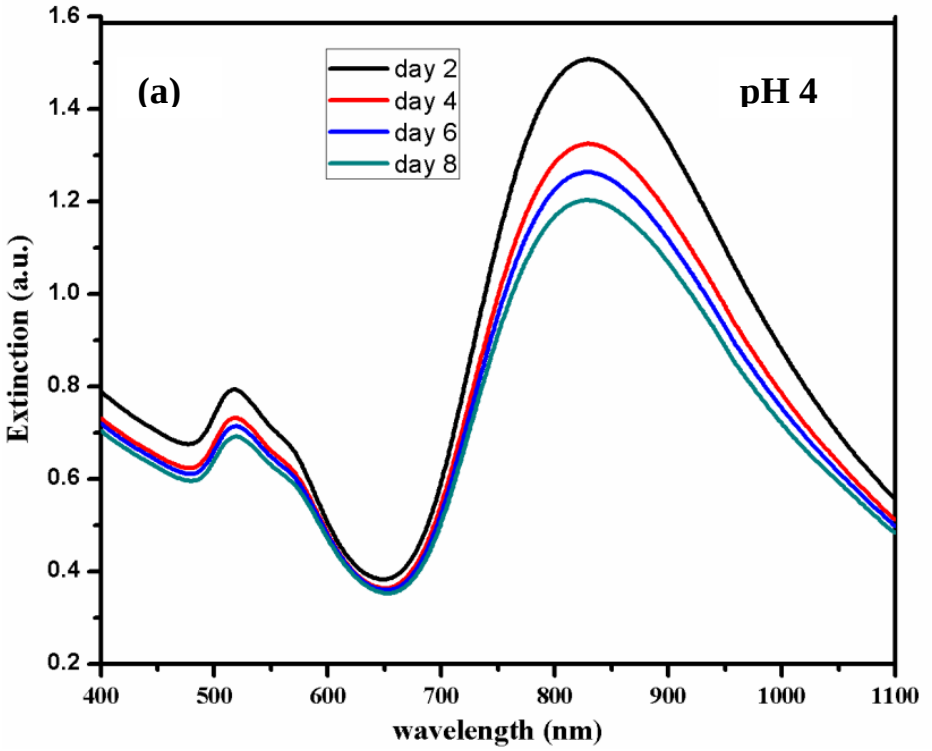
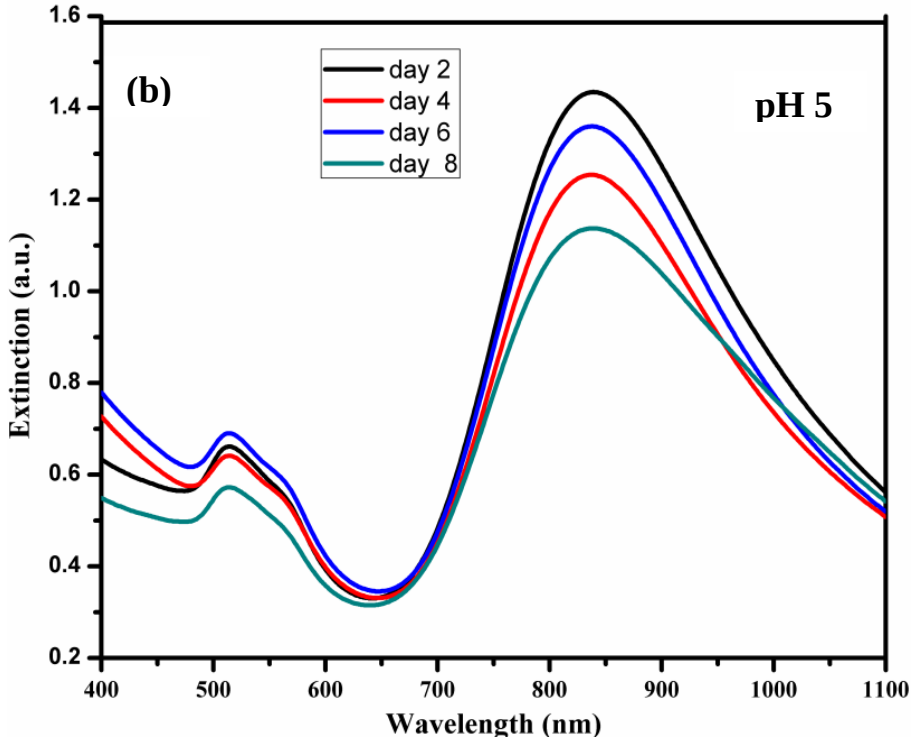


Figure S4. Representative TEM images (a & b) for side-to-side (red circles) assembly of PSS-Au NRs.





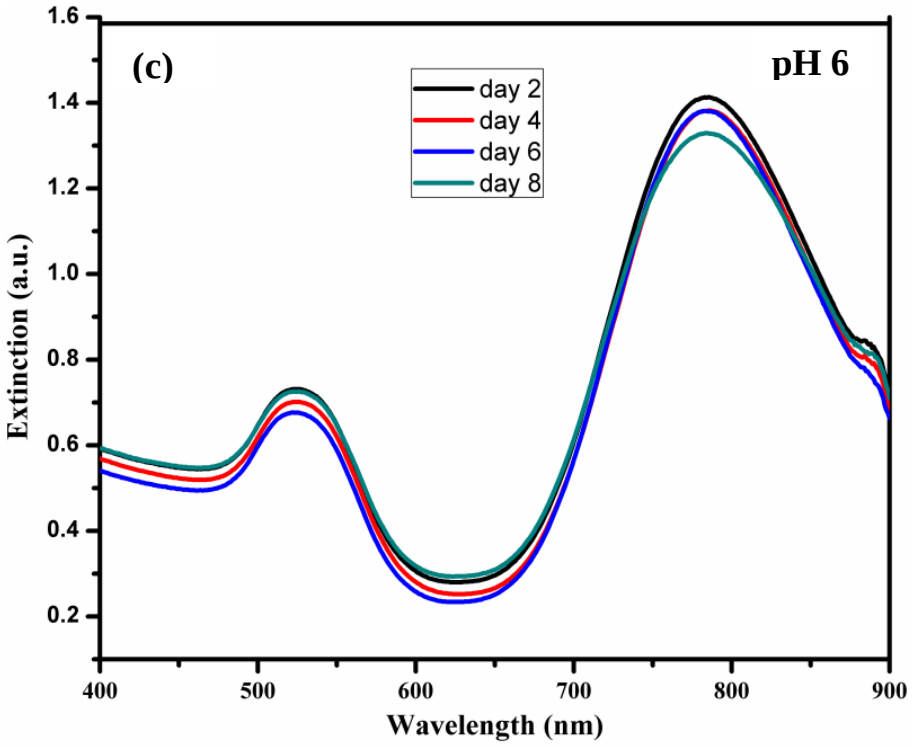


Figure S5. UV- Vis Extinction spectra of DOX@PSS-Au NRs at different pH values (a) pH 4 (b) pH 5 (c) pH 6 for the period of eight days.

S. No	Samples	Zeta potential (n=3)
1	Raw Au NRs	+ 68.43 ± 0.1
2	As-prepared Au NRs (centrifuged 2 times)	+ 46.86 ± 0.1
3	PSS - Au NRs	- 45.03 ± 0.2
4	0.7 µg DOX@PSS-Au NRs	- 43.50 ± 0.3
5	1.7 µg DOX@PSS-Au NRs	- 42.90 ± 0.0
6	2.8 µg DOX@PSS-Au NRs	- 41.30 ± 0.6
7	3.8 µg DOX@PSS-Au NRs	- 40.60 ± 0.3
8	4.7 µg DOX@PSS-Au NRs	- 39.50 ± 0.9
9	11.0 µg DOX@PSS-Au NRs	- 37.10 ± 0.0
10	23.8 µg DOX@PSS-Au NRs	- 34.43 ± 1.0

Table 1: Zeta potential of Raw Au NRs, as-prepared, PSS- Au NRs and DOX @ PSS – Au NRs

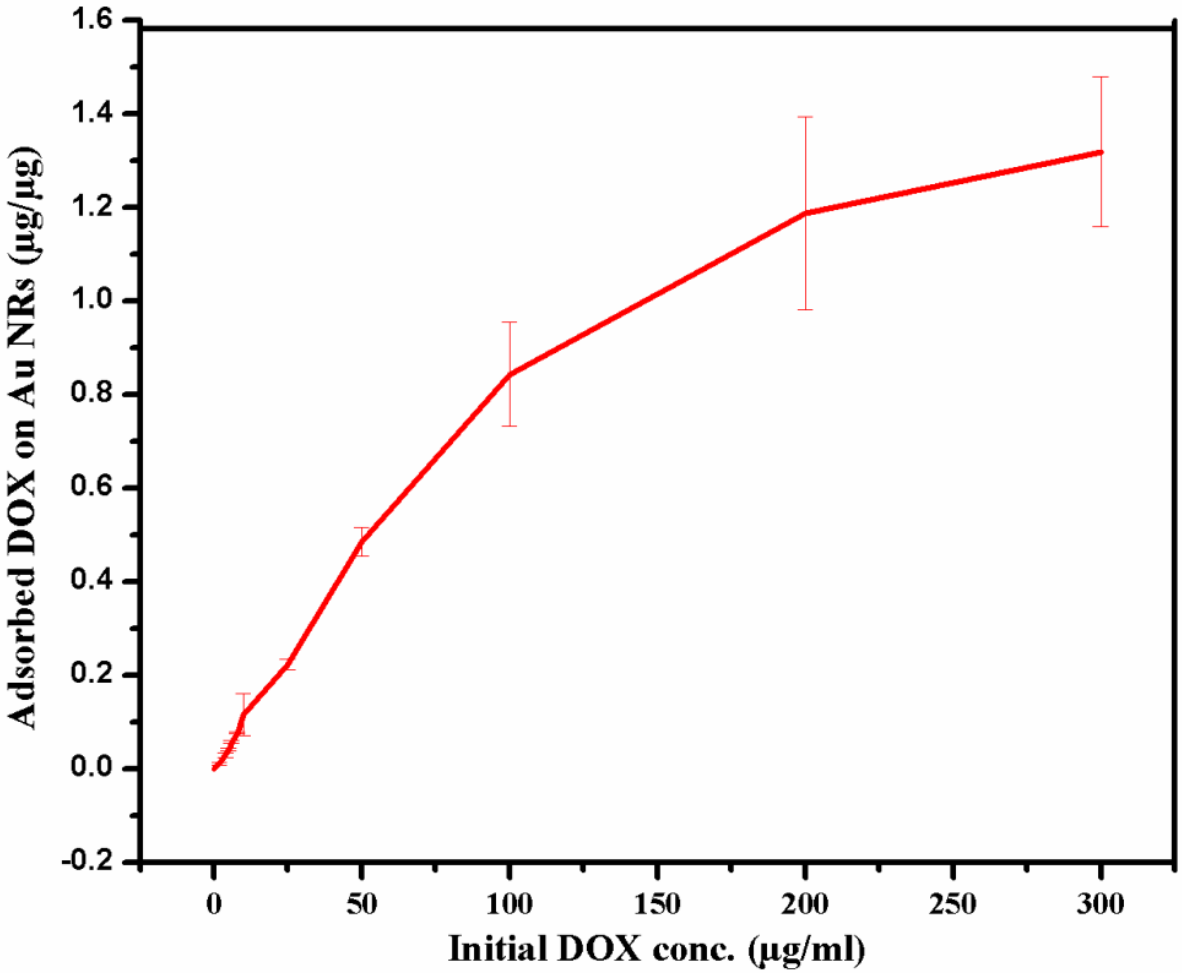
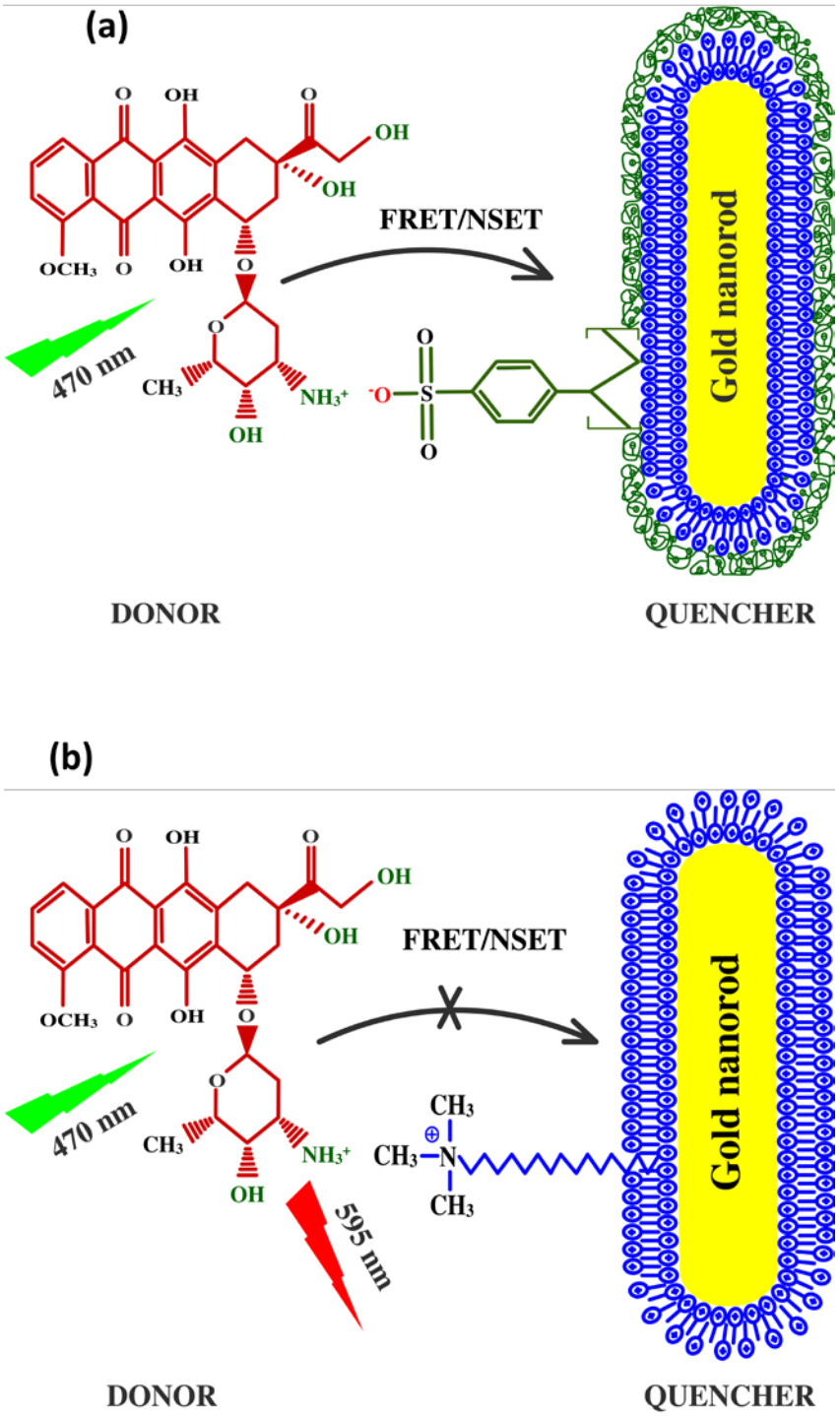


Figure S6. Langmuir adsorption isotherm shows the adsorption of DOX on PSS-Au NRs for different initial DOX concentration.



Scheme S1. Schematic representation fluorescence quenching and enhancement mechanism: (a) Fluorescence resonance energy transfer/nano surface energy transfer (FRET/NSET) of doxorubicin conjugated Au NRs. The Au NRs and doxorubicinyl groups functioned as the "quencher" and the "donor", respectively. (b) The fluorescence enhancement of doxorubicin occurs at longer distance from the Au NRs surface.

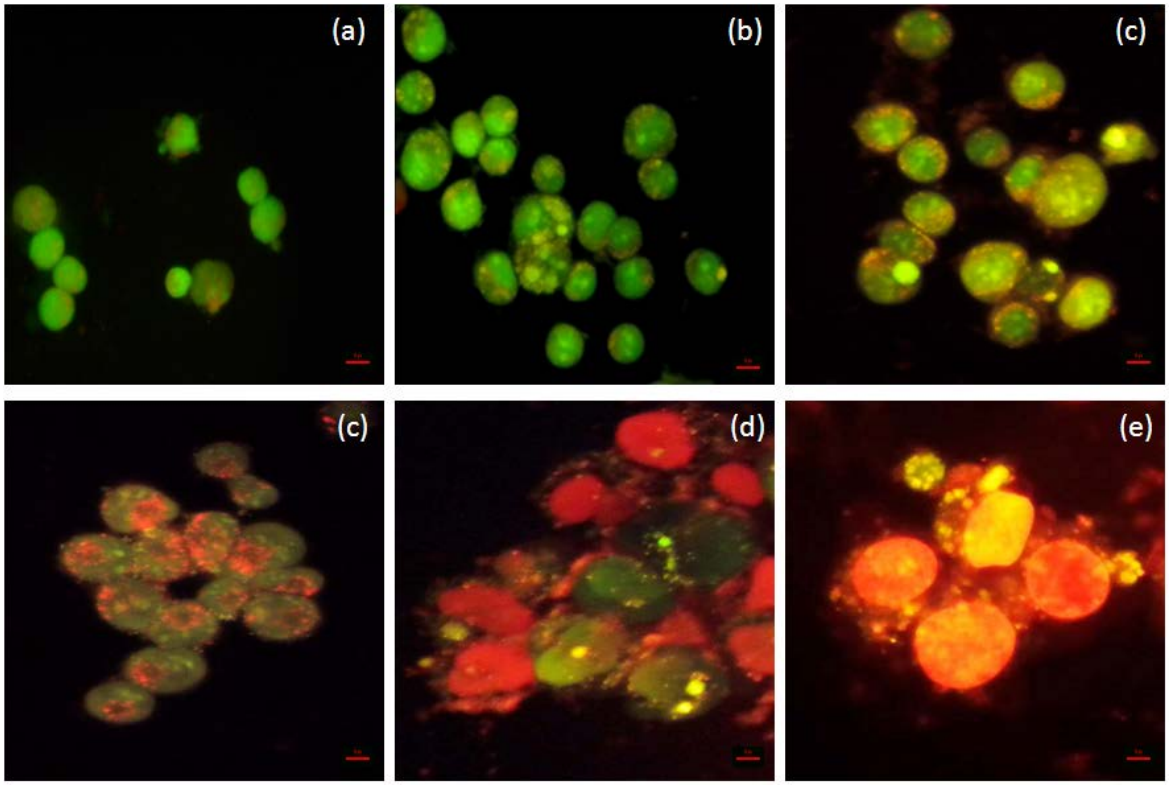


Figure S7. Fluorescent images of Ao/EB staining of free doxorubicin treated MCF-7 cells (a) control cells, (b) 1µg/ml, (c) 2µg/ml, (d) 3µg/ml, (e) 4µg/ml and (f) 5 µg/ml. Scale bar= 10µm.

Statistical analysis

The AO/EB results were expressed as mean ± standard deviation. The experiments were analyzed by two way ANOVA using Graph pad prism. The statistical significance of the graph (Figure 5a) is at a level of $P<0.001$