Supporting Information

for

**Redox stimuli delivery vehicle based on transferrin-caped MSNPs for targeted drug delivery in cancer therapy**

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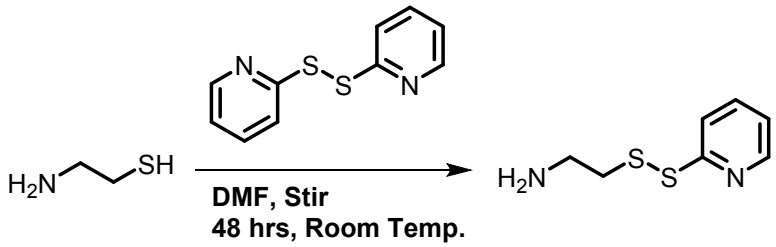
**Synthesis of S-(2-aminoethylthio)-2-thiopyridine hydrochloride**




**Scheme S1.** Synthesis of S-(2-aminoethylthio)-2-thiopyridine hydrochloride

S-(2-Aminoethylthio)-2-thiopyridine hydrochloride was synthesized according to a reported literature[23]. Typically, thiopyridyldisulfide (2.2 g, 10 mmol) was dissolved in MeOH (10 mL) solution containing acetic acid (0.4 mL). MeOH solution (10 mL) containing 2-aminoethylthiol hydrochloride (570 mg, 5.04 mmol) was added drop wise into the above solution for 30 min. After stirring for 60 h, solvent was removed under reduced pressure to yield a yellow oily product. The yellow oily product was washed with cold diethyl ether (50 mL) for two times and then dissolved in MeOH (10 mL). The solution was added to chilled (− 30 °C) diethyl ether (200 mL). Yellow precipitate started appearing, and this solution was kept at − 30 °C for 2 h for precipitate to settle down. Yellow precipitates were collected by vacuum filtration. Repeat the precipitation experiment to obtain a pure product.

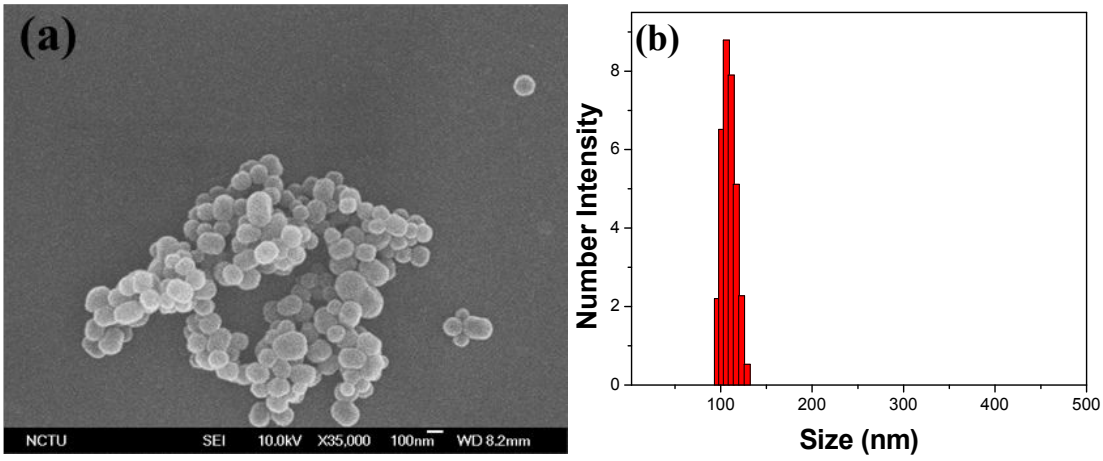



**Figure S1.** (a) SEM image of MSNP-SS-$NH_2$ (b) DLS particle size analysis of MSNP-SS-$NH_2$.

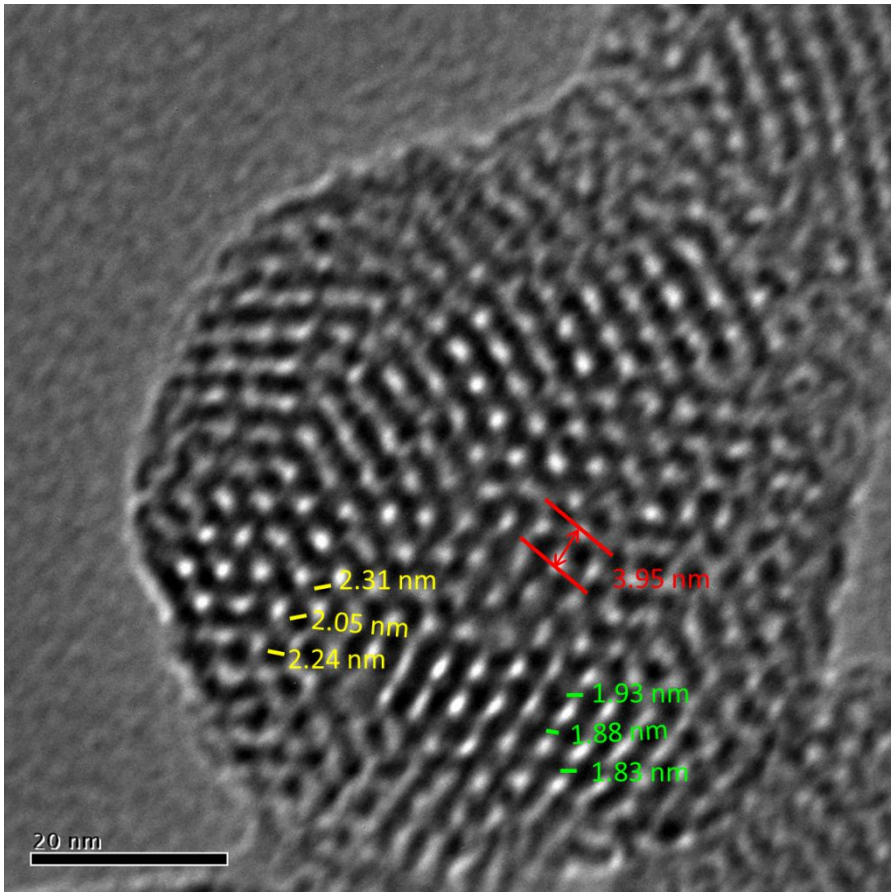



**Figure S2.** Enlarged HR-TEM images of MSNP-SS-$NH_2$ for calculating the interplanar distance of $d_{100}$ planes and thickness of the mesoporous wall.

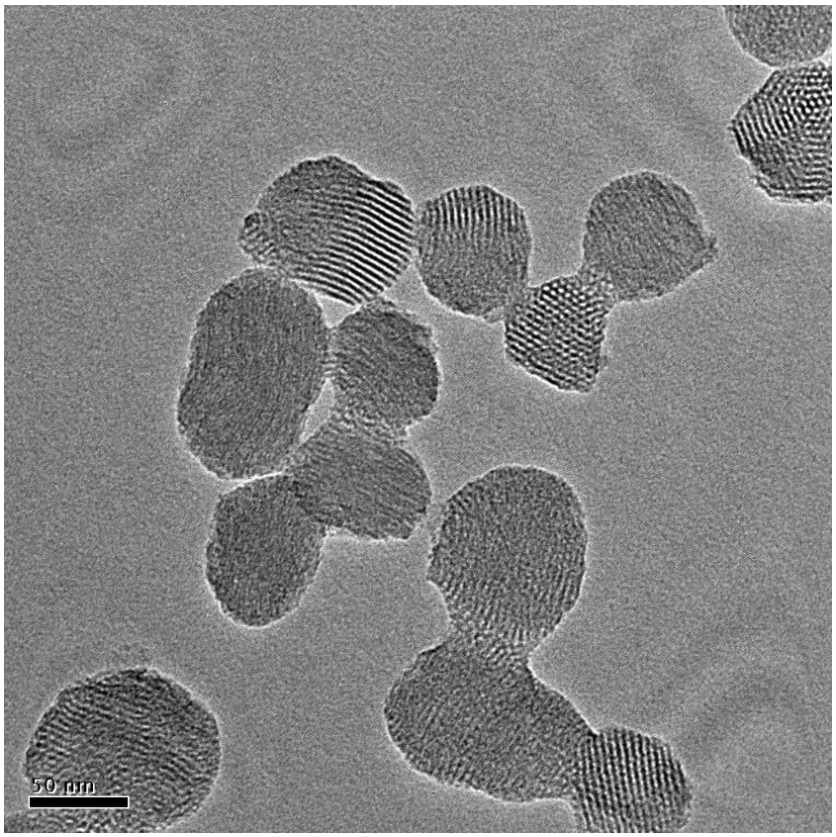



**Figure S3.** HR-TEM images of MSNP-SS-Tf

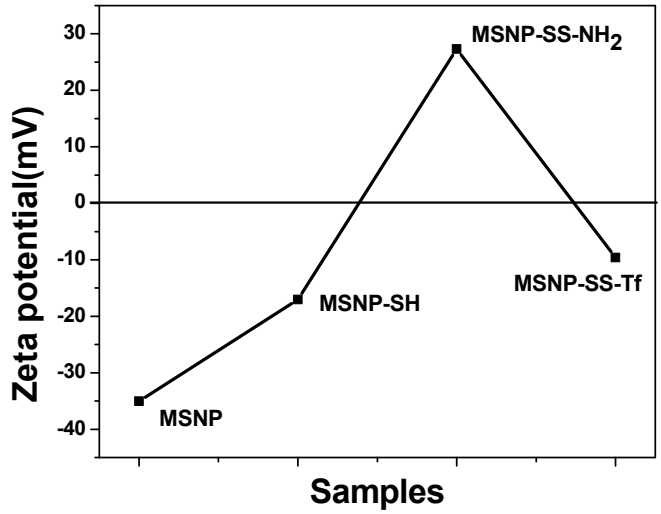



**Figure S4.** Zeta potential values of different mesoporous silica nanoparticles during the different functionalization.

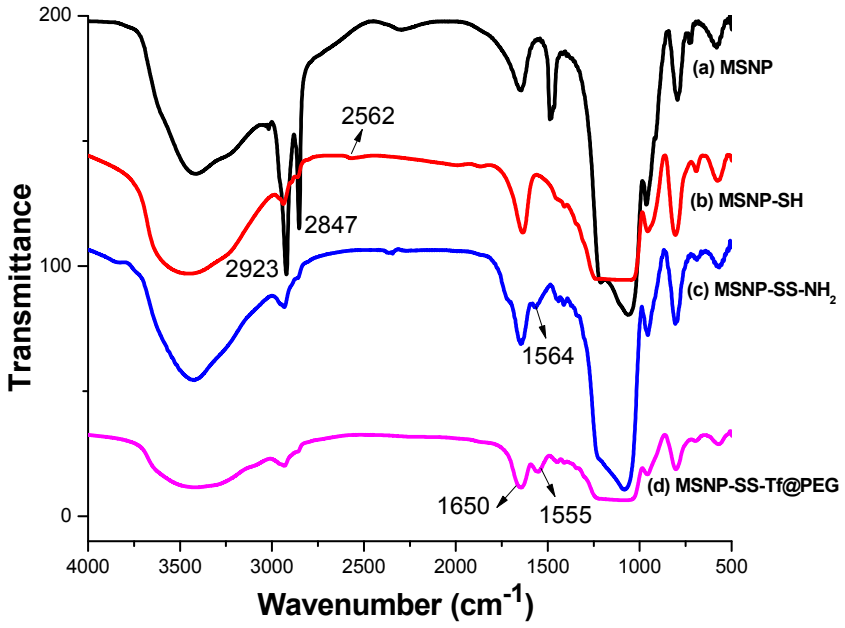



**Figure S5.** FT-IR spectra of silica nanoparticles under indicated conditions: (a) MSNP containing surfactants (b) MSNP–SH (c) MSNP–SS–$NH_2$ and (d) MSNP–SS–Tf@PEG.

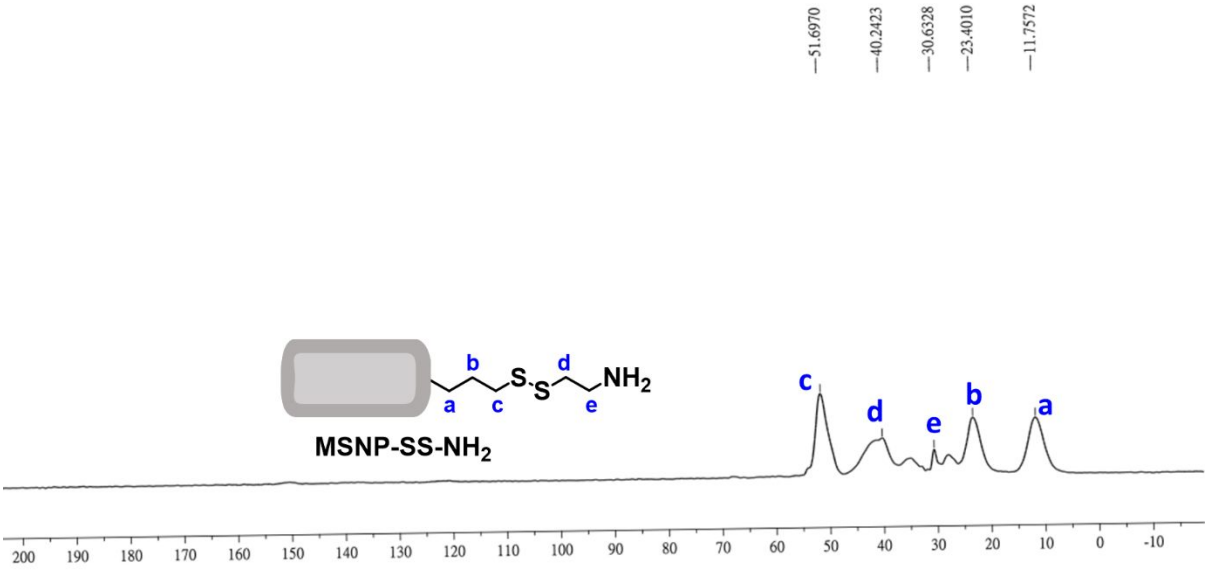



**Figure S6.** $^{13}C$ Solid state NMR spectrum of MSNP-SS- $NH_2$

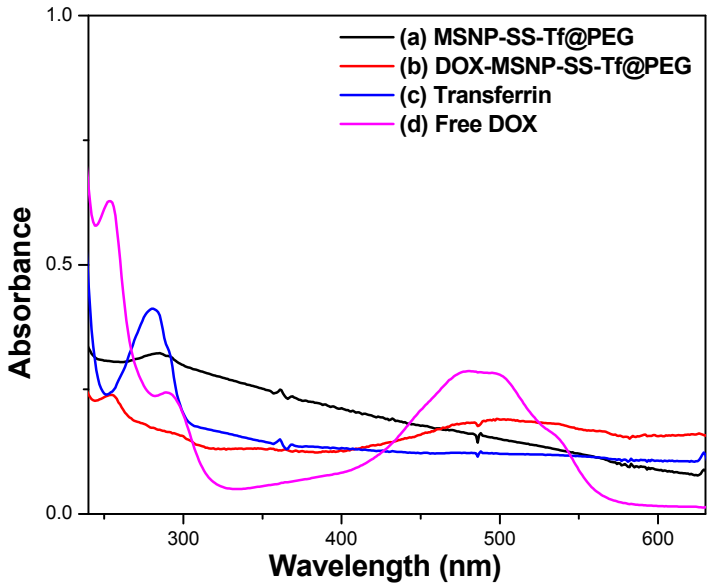



**Figure S7**. UV-vis spectra of silica nanoparticles under indicated conditions: (a) MSNP–SS-Tf@PEG (b) DOX loaded MSNP–SS–Tf@PEG (c) transferrin and (d) free DOX

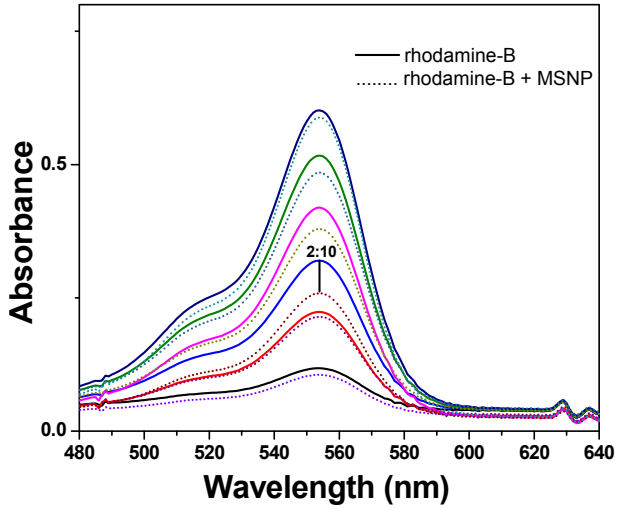



**Figure S8.** Absorbance spectra of rhodamine B (——) before loading and (- - - - -) after loading under different rhodamine B to nanoparticles loading weight ratios. Weight ratio of Rh-B mg/MSNP mg is from 0.5:10 to 5:10.

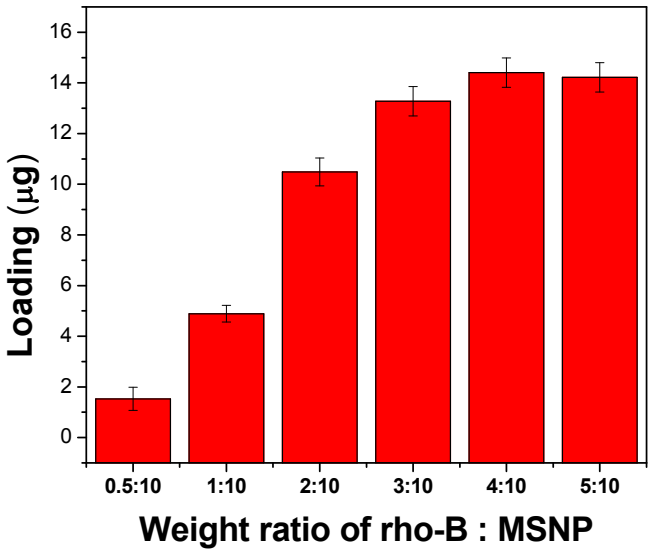



**Figure S9.** Rhodamine B loading capacity of MSNP-SS-$NH_2$ under different nanoparticle-to-rhodamine B loading weight ratios.

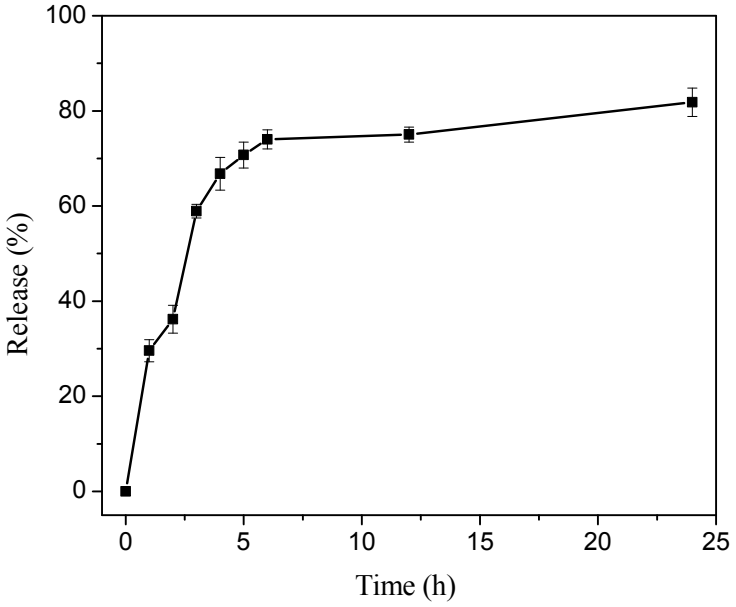



**Figure S10.** The release profile of Rhodamine B from Rhodamine B loaded MSNP-SH in PBS (pH 7.4)

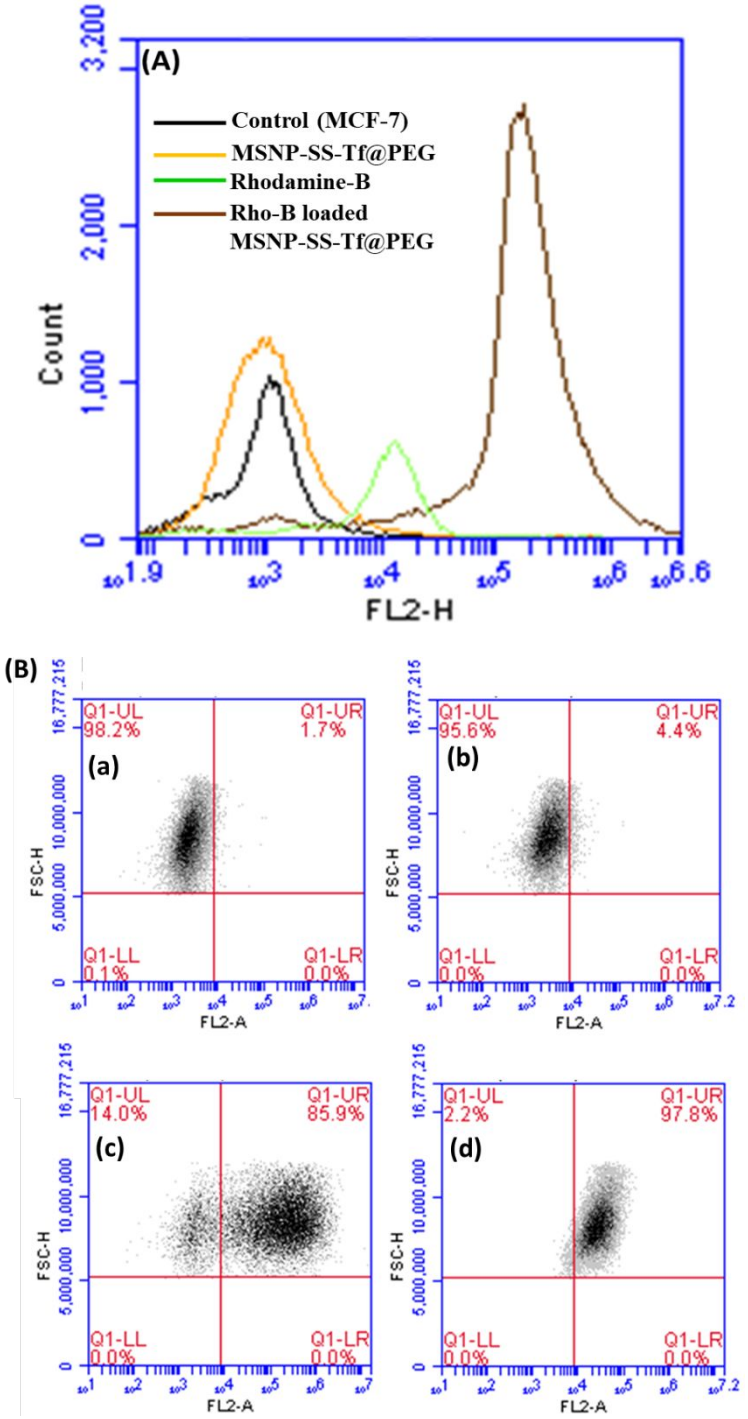



**Figure S11.** (A) Flow cytometry histogram of MCF-7 cell line (control), incubated with MSNP-SS-Tf@PEG, rhodamine B loaded MSNP-SS-Tf@PEG for 4h. (B) Two dimensional dot plot of (a) control MCF-7 cell, (b) incubated with MSNP-SS-Tf@PEG, (c) only rhodamine-B for 4h, and (d) incubated with rhodamine loaded MSNP-SS-Tf@PEG for 4 h.