Electronic Supplementary Information (ESI) for:

Glutathion-triggered release of model drug molecules from mesoporous silica nanoparticles *via* non-redox process

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Experimental Section

Materials and reagents. Tetraethyl orthosilicate (TEOS), *N*-hexadecyltrimethylammonium bromide (CTAB), sodium hydroxide (NaOH), rhodamine 6G (R6G), sodium nitrate ($NaNO_3$), and L-glutathione reduced (GSH) were obtained from Sigma-Aldrich. Anhydrous ethanol was received from Fischer Scientific. All the reagents were of analytical grade and used as received without further purification. Deionized water was used throughout the experiments.

Synthesis of mesoporous silica nanoparticles (MSNs). MSNs were synthesized by the following previously published procedures.[1] After letting CTAB (1.00 g, 2.74 mmol) dissolve in 480 mL deionized water at 80 °C, aqueous solution of NaOH (2.00 M, 3.5 mL) was added into the solution. Then, TEOS (5.00 mL, 22.4 mmol) was added into the solution drop-wise. The above solution was stirred for 2 h at 80 °C, during which time a white precipitate was formed. The resulting mixture was filtered, and the solid product was collected and washed over a filter paper with deionized water and ethanol. It was then let to dry at 60 °C in oven producing as-synthesized mesostructured silica nanoparticles.

To remove the CTAB surfactant templates from the nanoparticles, 1 g of the as-synthesized mesostructured silica was stirred at 60 °C for 12 h in a solution containing 1.5 mL concentrated HCl and 100 mL ethanol. The solid product collected with filtration was washed with copious amount of deionized water and ethanol, then dried at 60 °C in oven, finally producing MCM-41 type mesoporous silica nanoparticles (MSNs).

Preparation of R6G-loaded MSNs (RMSNs). The surfactant-extracted MSNs (100 mg) and R6G (25 mg) were suspended in ethanol (20 mL). Then the suspension was stirred for 24 h at 70 °C to get the maximum possible loading of R6G molecules into the pores of MSNs. The solid product was collected via centrifugation and

washed with deionized water to remove residual R6G off the surfaces of the MSNs, and then dried in oven at 70 °C overnight. The resulting R6G-loaded MSNs were denoted as RMSNs.

Calibration curve for concentration of R6G versus absorbance. Different concentrations of aqueous R6G solutions were prepared (0.1, 2, 3, 4, 5, and 6 μg/mL) and then their absorbance was measured with UV-Vis spectroscopy in the range of 400 nm to 600 nm. The intensity of the absorption maximum at 527 nm corresponding to R6G was then correlated with the concentration of R6G according to Beer-Lambert law. The equation was then applied to obtain the amount of R6G released in the release studies of R6G molecules from RMSNs.

Studies of R6G release: RMSNs were dispersed in different solvent/solutions to make 1 mg/mL nanoparticle dispersion. These solvent/solutions were deionized water, 0.1 mM aqueous GSH solution, 1 mM aqueous GSH solution, 1 mM aqueous GSH adjust pH to 6.00, and 1 mM $NaNO_3$ aqueous solutions. While the particles and the solutions were stirring at room temperature, 1 mL of the dispersion was withdrawn at different time points and centrifuged. The absorption spectrum of the supernatant was then scanned with UV-Vis spectrometer.

Characterizations and instrumentations. Powder X-ray diffraction (PXRD) patterns were obtained using a Bruker HiStar area detector and an Enraf-Nonius FR571 rotating anode X-ray generator equipped with a graphite monochromator (Cu $K\alpha$; λ= 1.5418 Å) operating at 40 kV and 63 mA. The beam was monochromatized using a Rigaku osmic mirror in parallel mode. Scanning electron microscopic (SEM) images were taken on a Zeiss Sigma Field Emission scanning electron microscope (SEM). TEM images were obtained with a Topcon 002B TEM microscope operating at 200 KV. UV-Vis spectra were recorded on a Lambda 950 spectrophotometer (PerkinElmer). Nitrogen adsorption-desorption isotherms were measured using a Micromeritics Tristar-3000 instrument. Prior to each measurement, the sample was degassed at 323 K overnight with nitrogen flow. Using the isotherms, the surface area

of the materials was obtained with the Brunauer-Emmett-Teller (BET) method and their pore size distributions were determined with the Barrett-Joyner-Halenda (BJH) method. pH values were determined with Accumet pH meter 915 (Fisher Scientific).

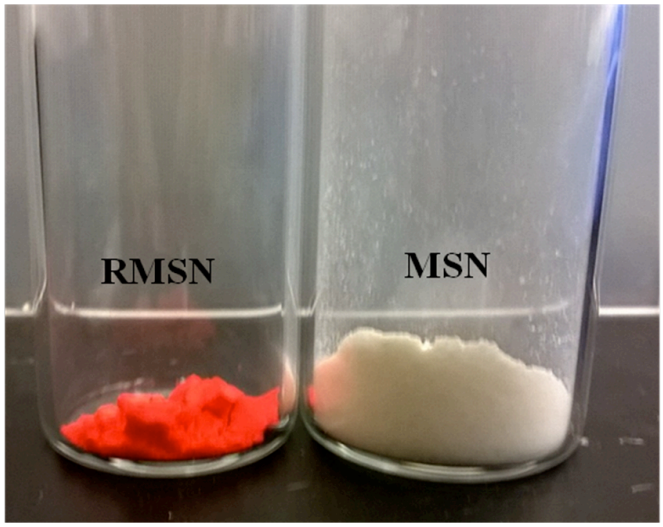

Fig. S1. Photographs of RMSNs and MSNs.

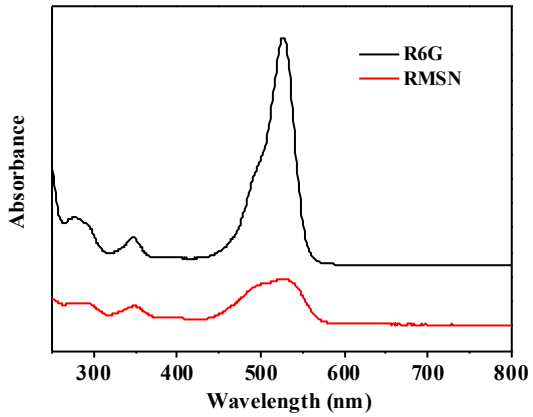

Fig. S2. UV-Vis absorption spectrum of R6G solution (black line) and diffuse reflectance UV-Vis spectrum of RMSNs (in solid-state) (red line).

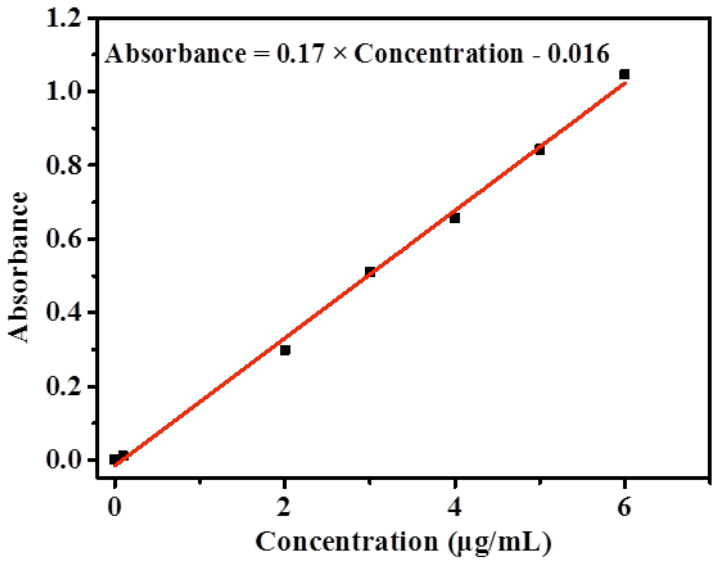

Fig. S3. Standard curve of intensity of absorption maximum of R6G at 527 nm versus concentration of R6G in distilled water.

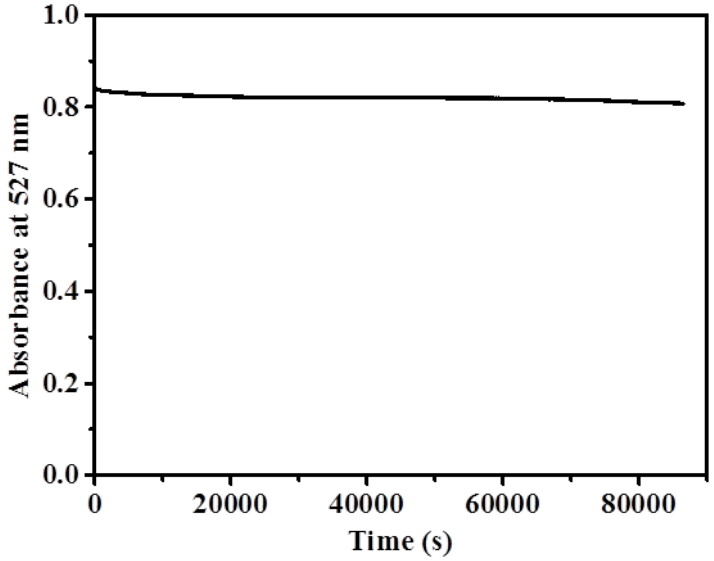

Fig. S4. Absorbance of 5 µg/mL R6G at 527 nm over 24 h.

References for Supporting Information

1. Y. Zhao, B. G. Trewyn, I. I. Slowing, V. S.-Y. Lin, *J. Am. Chem. Soc.*, 2009, **131**, 8398.