

Electronic Supplementary Information

A facile route to hollow nanospheres of mesoporous silica with tunable size

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Experimental section

Materials: (-)-N-Dodecyl-N-methylephedrinium bromide (DMEB, 99%) was from Aldrich. Ibuprofen (IBU, 99%) was from Shanghai Yuanji Chem. Co. Carboxyethylsilanetriol sodium salt (CSS, 25% in water) was from ABCR. Tetraethyl orthosilicate (TEOS, 98%), hydrogen chloride (36.5%), ethanol (99%), hexane, and sodium hydroxide were purchased from Shanghai Chem. Agents Co. and used without further purification.

Preparation of hollow mesoporous silica nanosphere: An aqueous solution was prepared immediately after (-)-N-Dodecyl-N-methylephedrinium bromide (DMEB) had been mixed into dilute NaOH solution under stirring. Carboxyethylsilanetriol, sodium salt (CSS) was then added to the aqueous solution with stirring until the solution became clear again. Next, TEOS was dropped into the solution mentioned above with vigorous stirring for another 2 h. The mole composition of the sol was 1DMEB:0.2 CSS: 1NaOH:30TEOS:7141H₂O. The resulting gel was sealed in Teflon-lined autoclaves and heated at 100 °C for 24 h. The solid product was recovered by

high-speed centrifugation and dried in an oven. The as-synthesized material was then extracted by ethanol mixed with a certain amount of HCl for 12 h at 78 °C under refluxing to get the HMSNs material.

Invitro drug storage study: A certain amount of HMSNs was added into 40 mg/ml ibuprofen hexane solution. The suspension was stirred for 24 h while the evaporation of hexane was prevented. Then the HMSNs with drug loaded were separated by high-speed centrifugation and dried in a vacuum oven at 60 °C. 1.0 ml filtrate was extracted with a vial and diluted to 100ml, and then was analyzed by UV/vis spectroscopy at a wavelength of 263.5 nm. Calibration curve of ibuprofen was determined by taking absorbance vs ibuprofen concentration between 0 and 200 mg/ml as parameters.

In vitro drug-release study: Three IBU-HMSN samples were separately immersed in simulated body fluid (SBF)^[9] at 37°C, with stirring at a rate of 100 rpm. Then, 2.0 mL release medium was removed for analysis at given intervals with a syringe, and the same volume of fresh release medium was injected. The extracted medium was diluted to a desired concentration with simulated body fluid, and analyzed by UV/Vis spectroscopy at a wavelength of 263.5 nm.

Characterization methods: TEM analysis was performed using a JEOL 2100 Electron microscope operated at 200 kV. FE-SEM image was obtained on JSM-6700F field emission scanning electron microscope at 10.0 kV. Powder XRD pattern was recorded on a Rigaku D/MAX-2550V diffractometer at 40 kV and 40 mA (Cu K α radiation). FT-IR spectrum analysis was performed on a Thermo Electron Corporation Nicolet 5700. N₂ adsorption–desorption isotherm was obtained on a Micromeritics Tristar 3000 pore analyzer at 77 K under continuous adsorption conditions. Brunauer, Emmett, and Teller (BET) and Barrett, Joyner, and Halenda (BJH) analyses were used to determine the surface area, pore size, and pore volume. The UV/Vis absorbance spectra were measured with a

Varian cary 500 UV-Vis-NIR Spectrophotometer.

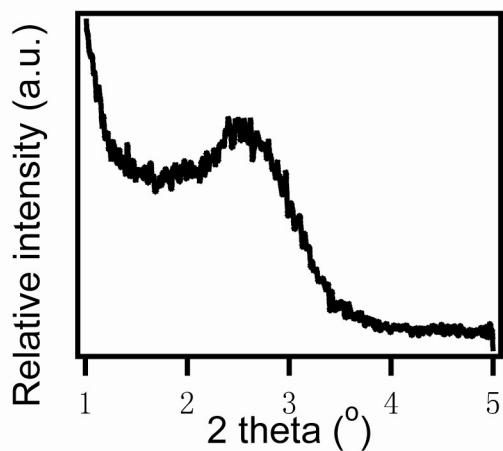


Figure S1 XRD pattern of the sample HMSN-1



Figure S2 SEM image of HMSN-2

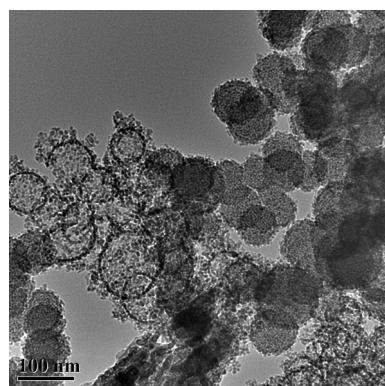


Figure S3 TEM image for the sample prepared without CSS

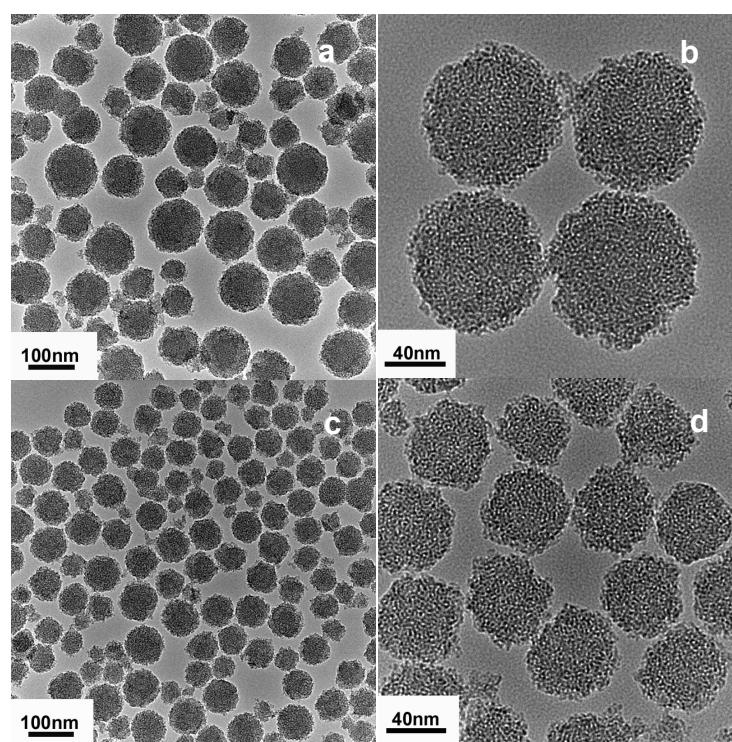


Figure S4 TEM images for the samples prepared with different DMEB concentrations of a,
b: 10 mM; c,d: 15 mM

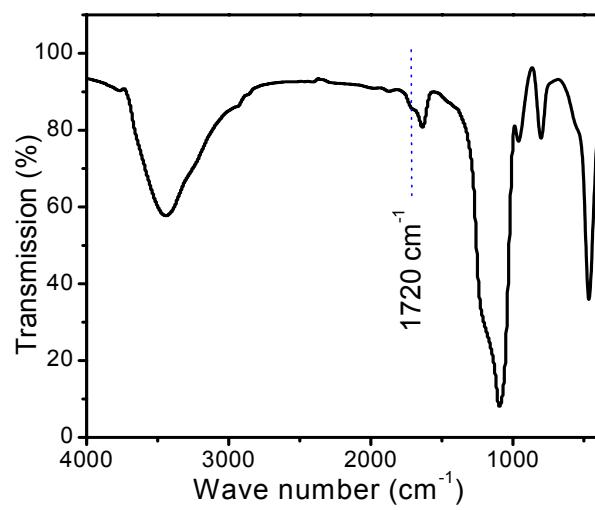


Figure S5 FT-IR spectrum for HMSN-2

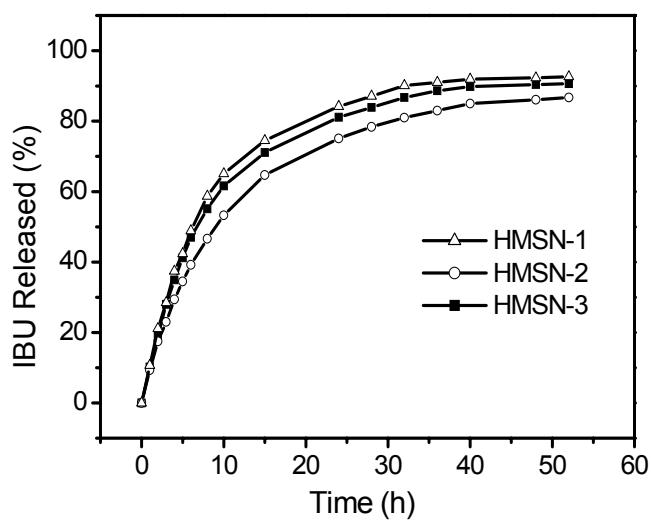


Figure S6 Cumulative drug release from the HMSN samples in simulated body fluid