

Supplementary Information

A facile and in-situ approach to fluorescent mesoporous silica and their applications in sensing and bioimaging

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1. Reagents

Tetraethyl orthosilicate (TEOS), citric acid, anhydrous toluene, anhydrous ethanol, methanol, sodium chloride and magnesium perchlorate were obtained from Sinopharm Chemical Reagent Co., Ltd. Other metal salts (as their perchlorates) were acquired from J&K Technology Co. Ltd. 3-(2-aminoethylamino)propyltrimethoxysilane (AAPTMS) was acquired from Aladdin Industrial Corporation. Tri-block copolymer PEO-PPO-PEO (P123) was purchased from Aldrich. All reagents and solvents were of at least analytical grade and used without further purification unless otherwise noted. Deionized water was used throughout the experiments.

2. Characterization

TEM images were taken on a JEOL 2100 HR electron microscope with an acceleration voltage of 200 kV. The nitrogen adsorption/desorption isotherms were measured at 77 K using an ASAP 2020 M analyzer. Prior to the measurement, the samples were degassed at 473 K for 400 min. The specific surface areas were calculated by the Brunauer-Emmett-Teller (BET) method and the pore size was calculated by the Barrett-Joyner-Halenda (BJH) model. Thermogravimetric analysis (TGA) was carried out on a Perkin-Elmer Pyris Diamond TG/DTA instrument under an air flow of 200 mL/min at a heating rate of 10 °C/min from room temperature to 800 °C. Fourier transform infrared (FT-IR) spectra were obtained on a Nicolet 6700 FT-IR spectrometer. Fluorescence emission spectra were measured on a Hitachi F-4600 spectrophotometer at ambient conditions. Small angle X-Ray powder diffraction (XRD) patterns were recorded on a Rigaku D/max-2000 X-ray powder diffractometer (Japan) using Cu K α (1.5405 Å) radiation.

3. Synthesis of SBA-15

Highly ordered mesoporous SBA-15 was synthesized according to the reported method with slight modification.^[S1] In a typical process, 4.0 g of P123 was added into 120 mL of HCl

solution (2.0 M). This solution was stirred at 38 °C until the P123 was dissolved completely. Then, 9.2 mL of TEOS was added into the above solution and stirred at 38 °C for 24 h. The above obtained suspension was transferred into a Teflon-lined autoclave, sealed and heated at 130 °C for another 24 h. After the autoclave was naturally cooled to room temperature, the product was collected by filtration, and washed with distilled water and dried at room temperature. The surfactant was removed by calcination method, i.e. increasing temperature from room temperature to 550 °C with a heating rate of 0.8 °C/min, and kept at 550 °C for 6 h.

Reference

[S1] D. Y. Zhao, Q. S. Huo, J. L. Feng, B. F. Chmelka, G. D. Stucky, *J. Am. Chem. Soc.*, **1998**, *120*, 6024.

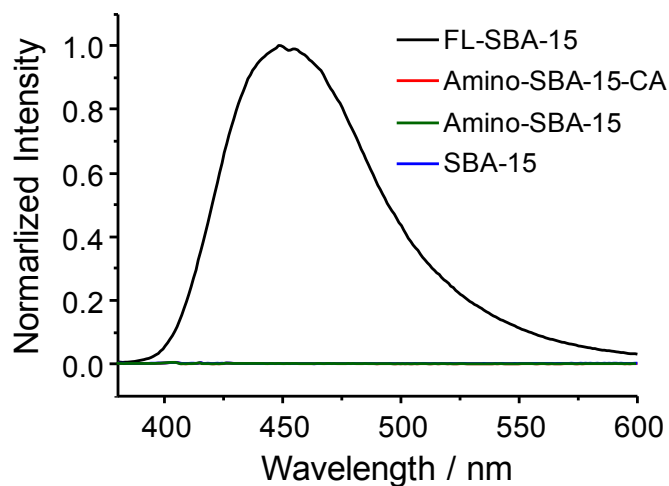


Figure S1. Fluorescence emission spectra of SBA-15, Amino-SBA-15, Amin-SBA-15-CA (i.e. Amino-SBA-15 was performed an adsorption reaction with citric acid in water at room tempeture), and FL-SBA-15 under the excitation at 360 nm.

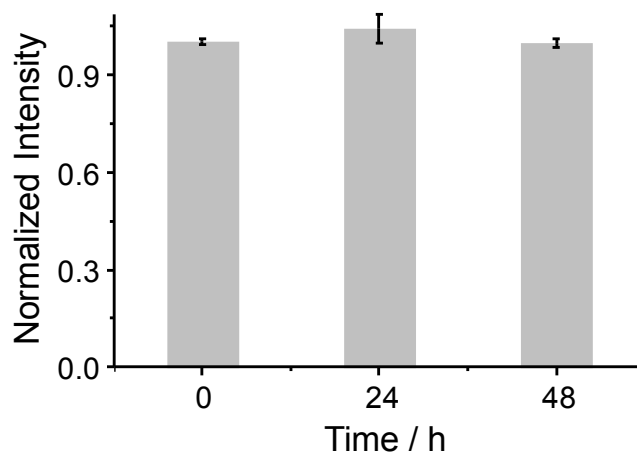


Figure S2. Comparison of fluorescent emission of FL-SBA-15 and water rinsed FL-SBA-15 (all at 0.02 g/L). The rinse of FL-SBA-15 was performed through dispersing and stirring it for 24 h and 48 h in deionized water. This result demonstrates no leaching of the organic fluorophore on SBA-15.

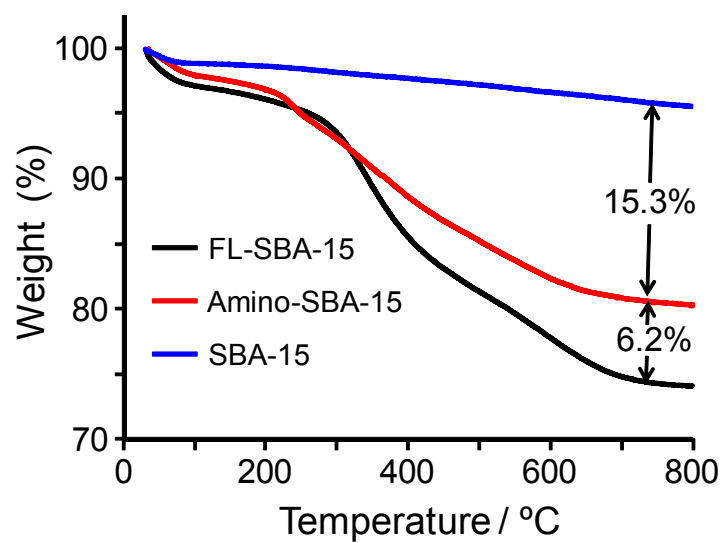


Figure S3. TGA curves of SBA-15, Amino-SBA-15 and FL-SBA-15.

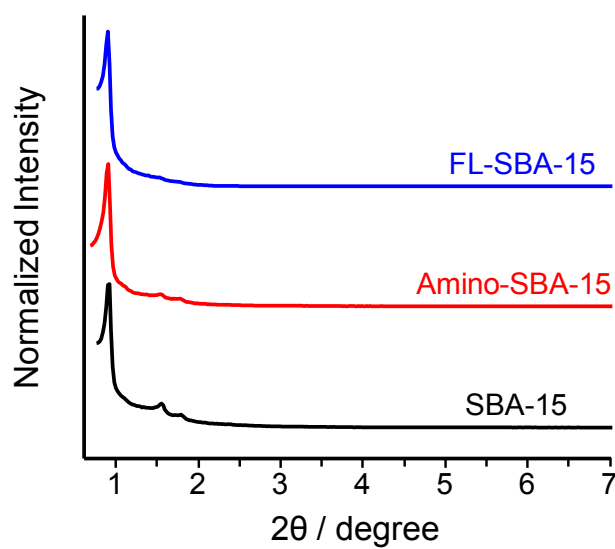


Figure S4. Small-angle XRD patterns of SBA-15, Amino-SBA-15 and FL-SBA-15.

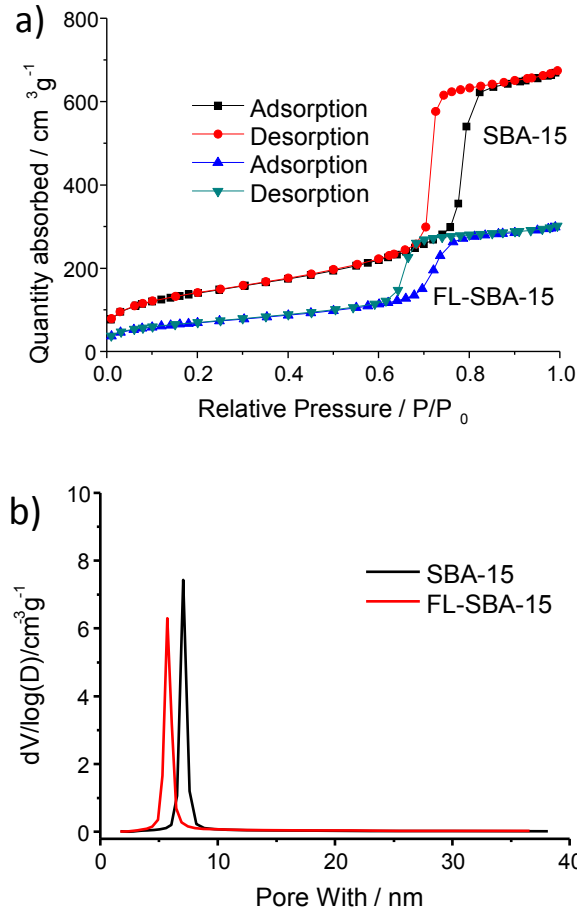


Figure S5. a) N₂ adsorption/desorption isotherms, and b) pore size distribution curves of SBA-15 and FL-SBA-15 by the Barrett-Joyner-Halenda (BJH) method applied to the desorption branch of the isotherm.

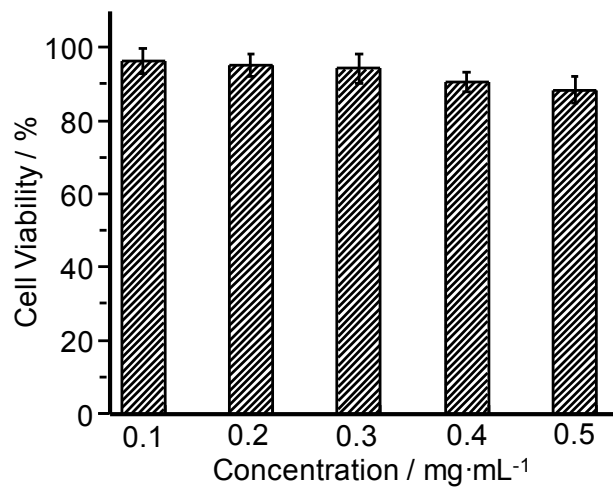


Figure S6. Cytotoxicity of FL-SBA-15 toward MCF-7 cells.