

Supplementary Information

Experimental Section

Tetraethyl orthosilicate (TEOS), HCl and ethanol were obtained from Sinopharm Chemical Reagent Co. Poly(ethylene oxide)-b-poly(propylene oxide)-b-poly(ethylene oxide) (Pluronic F127, PEO₁₀₆-PPO₇₀-PEO₁₀₆ with molecular weight of 12600), cetyltrimethylammonium bromide (CTAB), polyoxyethylene (10) cetyl ether (Brij56), and Rhodamine 6G (R6G) were purchased from Sigma-Aldrich. All chemicals were used as ordered.

Multi-walled carbon nanotube (MWCNT) arrays were synthesized in a quartz tube furnace with diameter of 1 inch. Ethylene served as the carbon source, and Ar with 6% H₂ was used as a carrier gas. The used catalyst was composed of Fe (0.8-2.0 nm)/Al₂O₃ (10 nm) on a SiO₂ (~1 μm)/Si substrate. The Al₂O₃ and Fe films were sequentially coated on the substrate by electron beam evaporation. Typically, the growth was carried out at 750 °C with 30 sccm ethylene and 170 sccm carrier gases for 10-40 min. The diameters of MWCNTs were tuned by varying the catalyst thickness and other growth parameters.

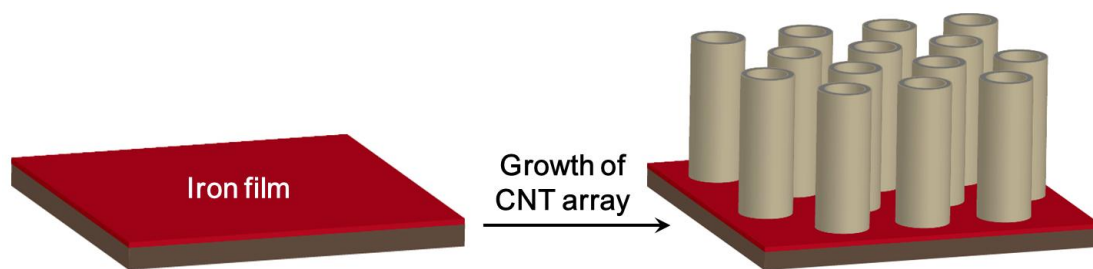


Fig. S1 Schematic illustration to the growth of MWCNT array by a chemical vapor deposition process. The thin iron film on the silicon substrate is used as the catalyst.

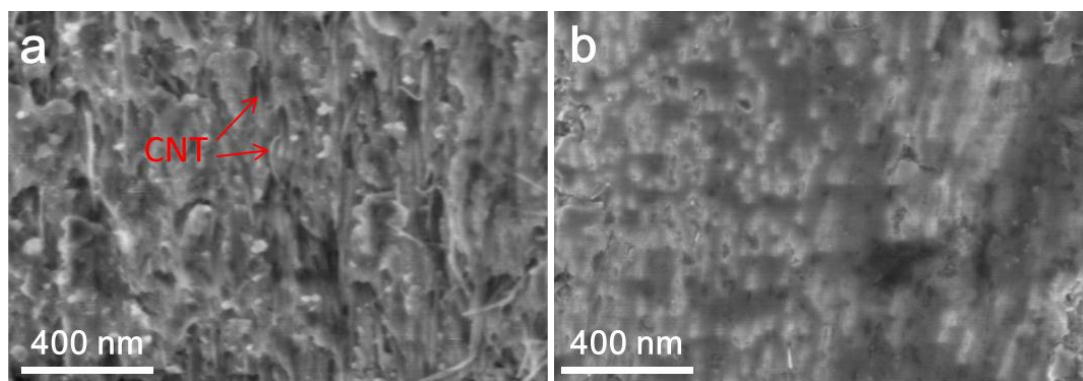


Fig. S2 Scanning electron microscopy (SEM) images of a silica/MWCNT composite array by (a) side and (b) top views, respectively.

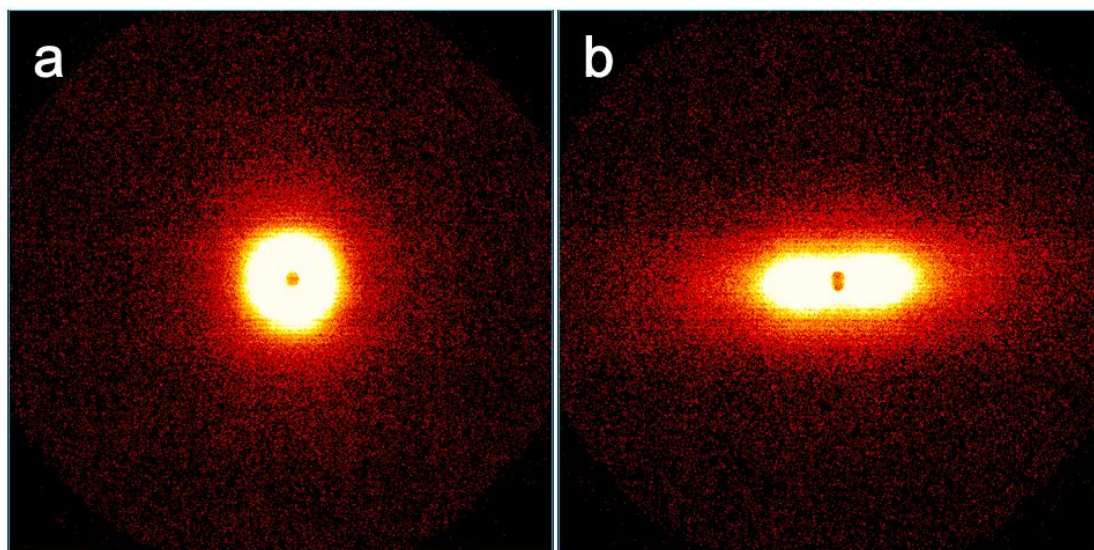


Fig. S3 SAXS patterns of mesoporous silica materials. (a) Based on the randomly dispersed MWCNTs as templates. (b) Based on the highly aligned MWCNTs as templates.

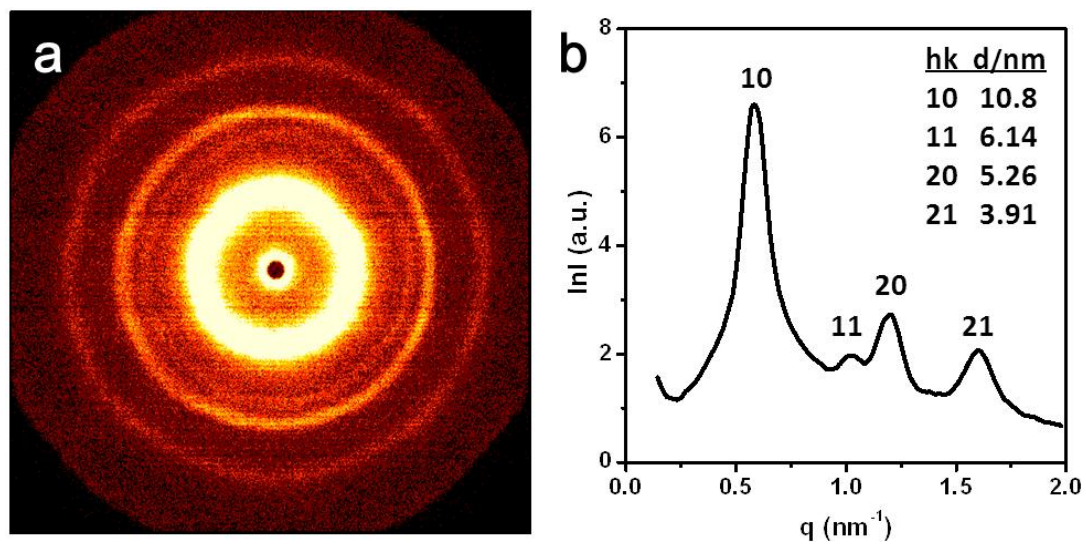


Fig. S4 (a) and (b) Two dimensional and linear SAXS patterns of the resulting mesoporous silica by using F127 as the surfactant.

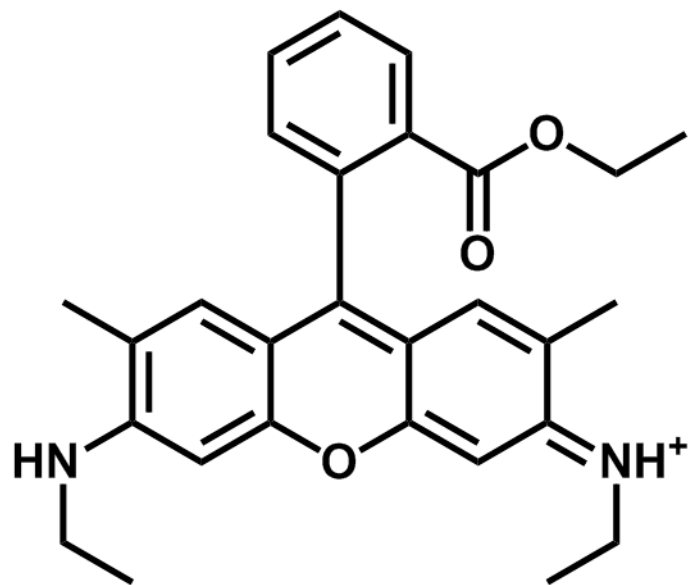


Fig. S5 Chemical structure of R6G.

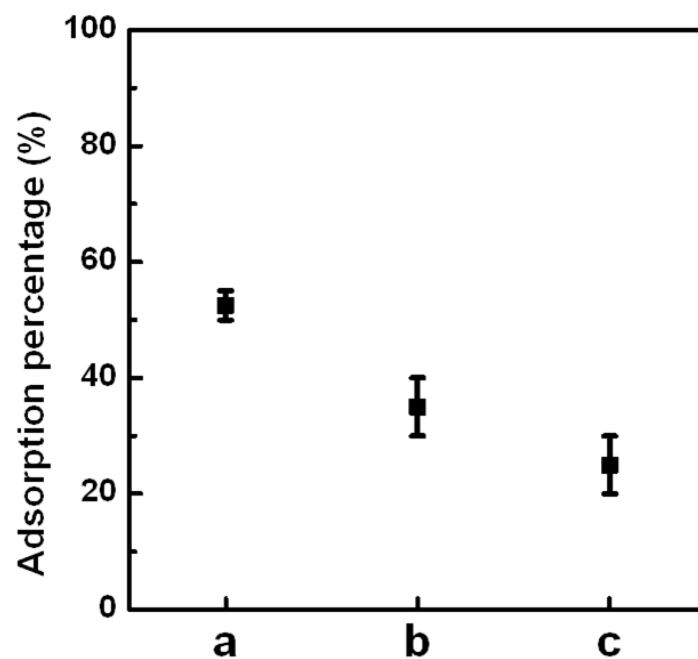


Fig. S6 Comparison on the adsorption of different mesoporous silica materials in the same R6G solution for 45 min. (a) Mesoporous silica derived only from aligned MWCNTs. (b) Mesoporous silica derived from both aligned MWCNTs and F127. (c) Mesoporous silica derived only from F127.

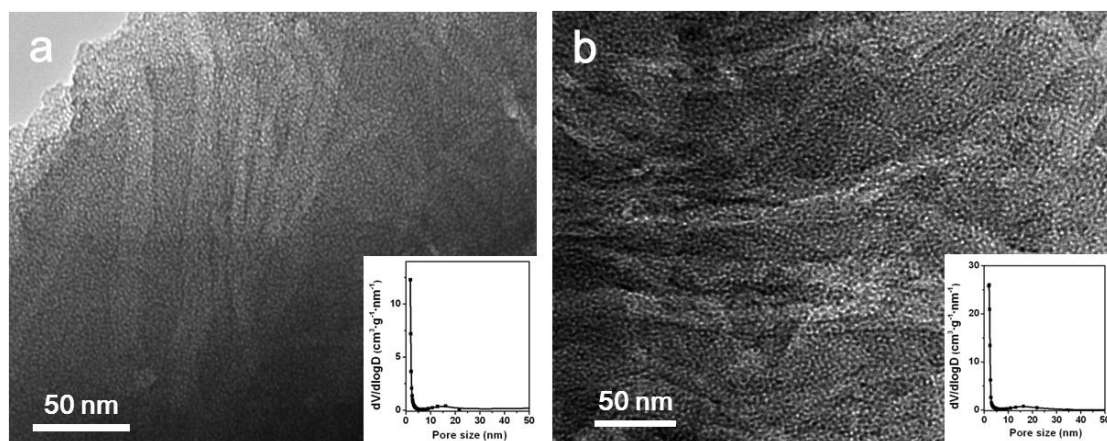


Fig. S7 TEM images of resulting mesoporous silica materials derived from aligned MWCNTs and other surfactants. (a) CTAB as the surfactant. (b) Brij56 as the surfactant.