Electronic Supplementary Information for:

Agitation InducedLoading of Sulphur into Carbon CMK-3 Nanotubes:

Scavenging of Noble Metals from Aqueous Solution

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1. Apparatus

X-ray diffraction patterns were collected on a Bruker D8 Advance Analytical X-ray System operating at 40 kV and 30 mA, using Cu-Kα (1.54 Å) radiation. SEM images were obtained using a LEO 1530 field emission scanning electron microscope. To avoid surface charging, specimens in the LEO 1530 were first sputtered with a thin layer of gold. Backscattering detection mode was used to obtain the micrographs. High resolution SEM images were taken with a Hitachi HD-2000 scanning transmission electron microscope (STEM) at a voltage of 200 KV. These specimens were not coated with any conductive layer; therefore, faithful surface morphology was provided. The N\textsubscript{2} sorption-desorption isotherms were measured at -196 °C by using a Quantachrome Autosorb Surface Area Analyzer. Solution concentration was determined by inductive coupled plasma mass spectrometry (ICP-MS) carried out by the Galbraith Laboratories (Tennessee, USA). Thermal gravimetric analysis (TGA) measurements were performed on a SDT Q600 analyzer.

2. Experimental

Nano-CMK-3 was prepared by the nanocasting method using SBA-15 nanorods as a template. In a synthesis of SBA-15 nanorods, 2 g of Pluronic P123 was dissolved in 360 ml of 2 M HCl at 38 °C. Tetraethylorthosilicate (TEOS, 4.2 g) was added into the above, vigorously stirred solution. The
mixture was stirred for 6 min and remained quiescent for 24 hrs at 38 ºC. It was subsequently heated at 100 ºC for another 24 hrs in an autoclave. The as-synthesized SBA-15 was collected by centrifugation, dried, and calcined at 550 ºC in air. To make the carbon replica, 1.25 g of sucrose was dissolved in 5.0 ml aqueous solution containing 0.14 g of H₂SO₄. Next, 1.0 g of surfactant free SBA-15 nanorods were dispersed into the above solution and the mixture was sonicated for 1 hr. The mixture was heated at 100ºC for 12 hrs and 160ºC for another 12 hrs. The above impregnation process was repeated once with another 5.0 ml aqueous solution containing 0.8 g sucrose and 0.09 g H₂SO₄. The composite was completely carbonized at 900ºC for 5 hrs in argon atmosphere. To remove the SBA-15 template, the composite was stirred in a 5% HF solution at room temperature for 4 hrs. Nano-CMK-3 nanorods were obtained after filtration. CMK-3 was prepared similarly by the nanocasting method using bulk morphology SBA-15 as a template.

For the melt-diffusion process, a mixture of nano-CMK-3 and sulfur was ground together, and heated to 155ºC. In a typical agitation-friction process, sulphur powder (0.1 g or 0.011g) and mesoporous carbon 0.1 g were simultaneously dispersed into 5 ml de-ionized water. The mixture was vigorously stirred for 24 hrs. The composite was collected by filtration and dried at 50ºC.

For adsorption kinetics studies, two sets of analyses with different dosage concentration were carried out. In the first set of analyses, an excess of sorbents (10 mg, 100 mg/L) was dispersed into a dilute solution of H₂PtCl₆ (100 ml, Pt: 5 mg/L). After specific time intervals, portions of the mixture were filtered to collect the filtrate for analysis. The solution concentration was determined by inductive coupled plasma mass spectrometry (ICP-MS) carried out in by the Galbraith Laboratories (Tennessee, USA). In the second set of analyses, sorbents (30 mg, 10 mg/L) were dispersed into an H₂PtCl₆ solution containing an excess of Pt (3000 ml, Pt: 5 mg/L). Portions of the mixture after specific time intervals were filtered to collect the adsorbents for analysis. The uptake of Pt by sorbents was measured by thermal gravimetric analysis (TGA).
3. Supplemental figures

**Fig.S1.** N$_2$ adsorption-desorption isotherms of (a) CMK-3, (b) nano-CMK-3.
Fig. S2. Schematic diagram depicting the agitation-friction process: (a) initial mixture of nano-CMK-3 and sulfur, (b) infiltration, (c) final stage corresponding to the complete infiltration of sulphur.
Fig. S3 Pore size distribution curves of (a) nano-CMK-3, and nano-CMK-3/S prepared by agitation-friction (b) before sulfur melting; (c) after sulfur melting.

- Surface area: 995 m²/g
  Pore volume: 1.1 cm³/g

- Surface area: 719 m²/g
  Pore volume: 0.92 cm³/g

- Surface area: 763 m²/g
  Pore volume: 0.95 cm³/g