Electronic Supplementary Material (ESI) for RSC Advances.

Supporting information for

Organic-inorganic hybridization for the synthesis of robust *in situ* hydrophobic polypropylsilsesquioxane aerogels with fast oil absorption properties

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1 Experimental methodology

1.1 Fabrication process of SA

TEOS (0.1 mol), ethanol (0.5 mol), water (0.3 mol), HCl (1M, 0.1 mL) and CTAB ($5*10^{-3}$ mol) were mixed and hydrolyzed at 90°C for 5 h with continuous stir. The sol (15 mL) was gelled by $NH_3 \cdot H_2O$ (1 M, 0.5 mL) in an oven at 50°C. Gelation usually took place within 10 min. Obtained gel was aged by ethanol (15 mL) for 1 d and subsequently soaked in hexane (15 mL) for 6 h (three times) at 50°C. Finally, the alcogel was supercritical CO_2 dried for 3 h (8 MPa, 40°C).

1.2 Fabrication process of PSA-7-T

PTES (0.07 mol) and TEOS (0.03 mol) were pre-mixed under vigorous stirring in a glass bottle. After 5 min of stirring, ethanol (0.5 mol), water (0.3 mol), HCl (1M, 1.0 mL) and CTAB ($5*10^{-3}$ mol) were added to the mixture and then hydrolyzed at 90℃ for 5 h with continuous stir. After hydrolyzation, the sol (15 mL) was transferred to a sealed glass vial and gelled by $NH_3 \cdot H_2O$ (12.4 M, 0.5 mL) in an oven at 50℃. Gelation usually took place within 5-6 h. Afterwards, the obtained gel was aged by ethanol (15 mL) for 1 d and subsequently soaked in hexane (15 mL) for 6 h (three times) at 50℃. Then, TMCS (0.5 mL dissolved in 14.5 mL hexane) was added to modify the surface of PSA-7. After modification, the modified gel was washed by hexane (15 mL) for three times. Finally, the alcogel was ambient pressure dried (APD) in a gradient of 60, 80, 100 and 120℃ and stay at each temperature for 2 h. For comparison, samples without the incorporation of PTES (SA) and TMCS modified PSA-7 (PSA-7-T) were synthesized through a similar process to that of PSA-7 system.

1.3 Digital photographs of phase separated precursors

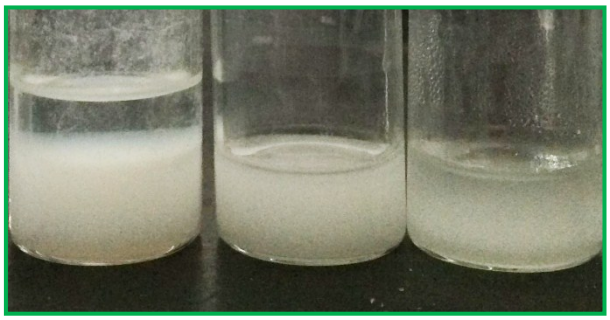

Figure S1. Digital photographs of PSA-7 alcogel and phase separation samples with different amounts of PTES (70%, 80% and 90%, from left to right).

2 Results and discussion

2.1 SEM images of PSA-7-T

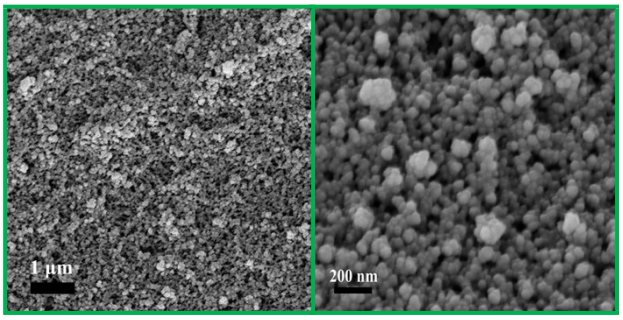

Figure S2. SEM images of TMCS modified PSA-7.

2.2 Compression-strain test of PSA-7

Figure S3. Photographs of PSA-7 after 70% compression. Few cracks were observed at the edge and surface (Left graph) of sample after compression. Bottom of the sample can remain smooth (Right graph).

2.3 Surface profile of PSA-7

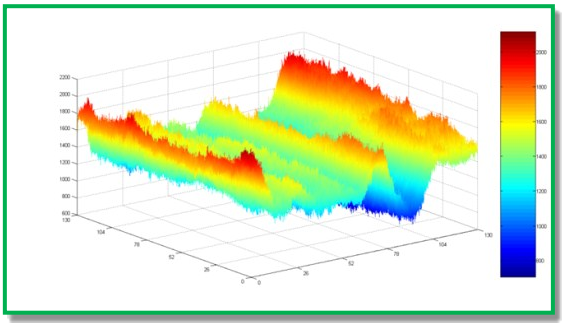

Figure S4. Surface profile of PSA-7 illustrated its rough surface endowed by the microstructure.

2.4 Absorption property of reused PSA-7 after 5 times

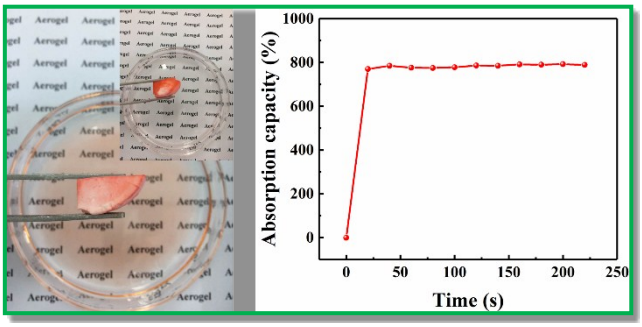

Figure S5. Absorption efficiency of PSA-7 for hexane and Absorption process of reused PSA-7 after 5 times for Sudan Ⅲ dyed hexane and absorption efficiency for hexane.

2.5 ^{29}Si NMR and FTIR spectrums of PSA-7-H

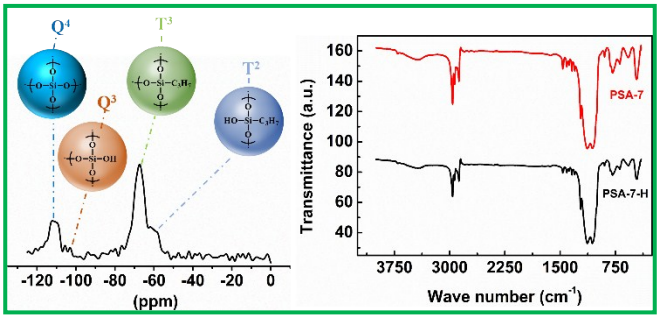

Fig. S6. ^{29}Si NMR spectrum of PSA-7-H (Left) and FTIR spectrums of PSA-7 and PSA-7-H (Right).