Supporting Information (SI) on

High removal of thiophene from model gasoline by porous MIL-101(Cr)/SA hybrid membrane

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X-ray diffraction (XRD)

Figure 1S shows the XRD patterns of the MIL-101(Cr) nanoparticles and porous MIL-101(Cr)/SA hybrid membrane. The X-ray diffraction pattern showed that as-synthesized MIL-101(Cr) nanoparticles presented many diffraction peaks, such as 5.892°, 8.902° and 16.527°, which matched well with the previously reported. From **Figure 1S**, one can also find that the diffraction peaks mentioned above all can be seen in the porous MIL-101(Cr)/SA hybrid membrane.

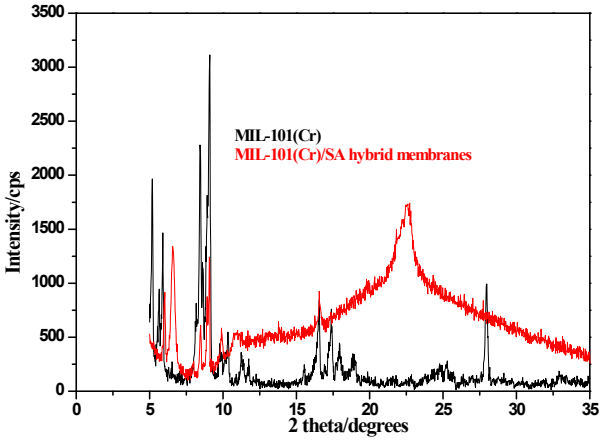


Figure S1: XRD patterns of MIL-101(Cr) nanoparticles and porous MIL-101(Cr)/SA hybrid membrane

Scanning electron microscope(SEM) analysis of MIL-101(Cr) nanoparticles

The morphology of the MIL-101(Cr) nanoparticles samples were examined by SEM and shown in Figure S2. It can be found from **Figure S2** that the size of as-prepared MIL-101(Cr) nanoparticles is about 61 nm.

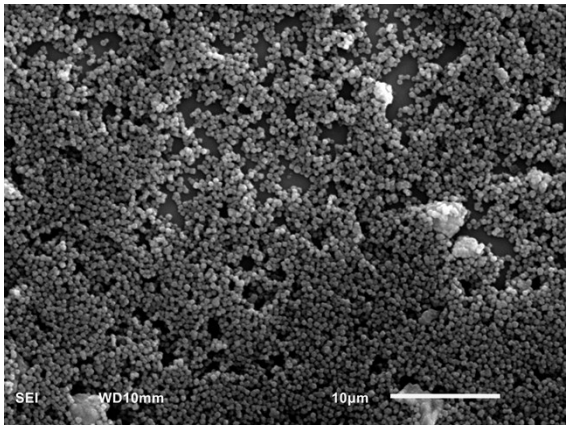


Figure S2: SEM image of MIL-101(Cr) nanoparticles

Fourier transformed infrared spectrum(FT-IR)

The chemical property of MIL-101(Cr) nanoparticles was studied by FT-IR spectroscopy and shown in **Figure S3.** The band corresponding to COO^- stretching vibrations can be seen at 592 cm^{-1}. The band corresponding to benzene ring presents in the spectral region of 1023-746 cm^{-1}. The band appeared in the vicinity of 1631 cm^{-1} can be attributed to the vibration of -O-C-O- skeleton. The band in the vicinity of 1750 cm^{-1} corresponding to stretching of carbonyl of terephthalic acid can not be seen, indicating that terephthalic acid has been moved.

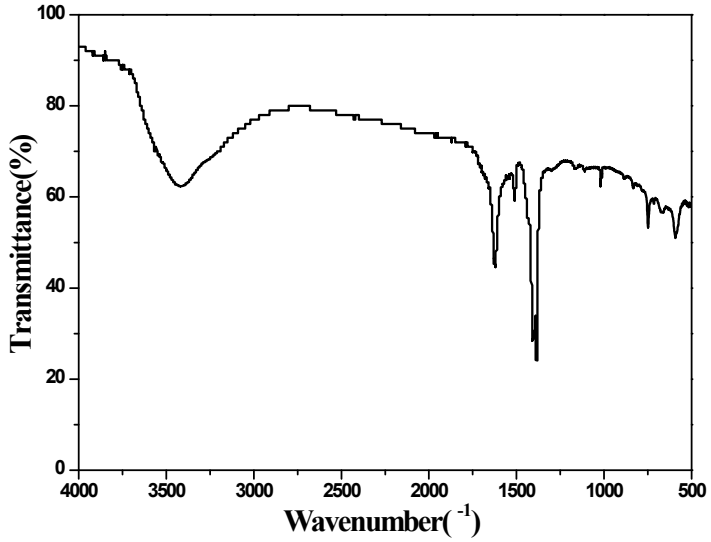
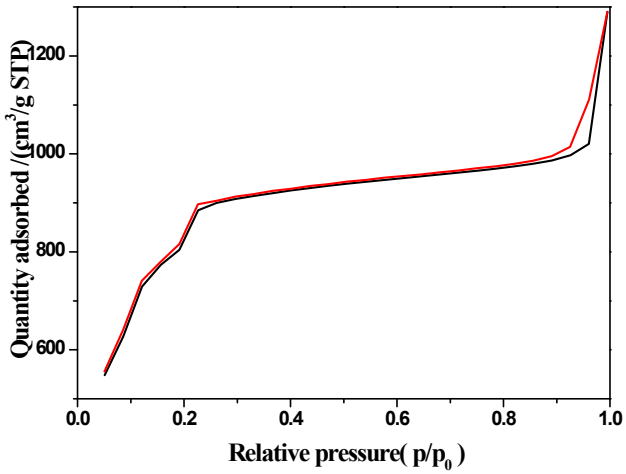


Fig. S3: FT-IR spectra of MIL-101(Cr) nanoparticles.

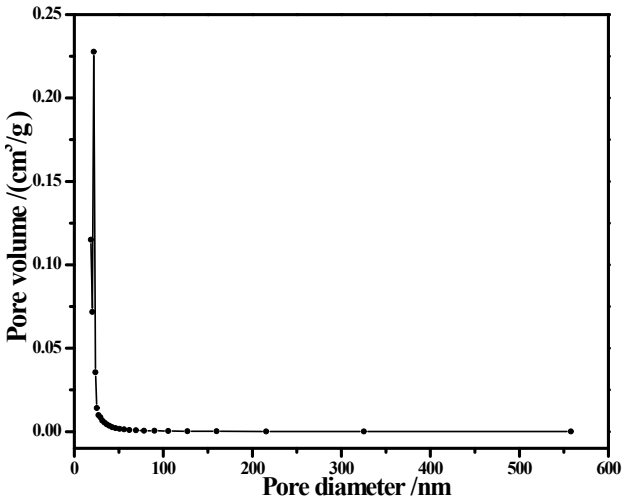
Specific surface areas and pore size distributions

The specific surface area and pore structure of the as-prepared MIL-101(Cr) nanoparticles was analyzed on the basis of nitrogen adsorption-desorption isotherms at –196 ºC and shown in **Figure S4 (a)** and **(b)**. Because there are two different sizes of cage-like structures in the MIL-101(Cr) nanoparticles, therefore, in the initial stage, with the increase of P/P_0, adsorption capacity of the MIL-101(Cr) nanoparticles increased dramatically, indicating that there are lots of microporous structures. Surface area of MIL-101(Cr) nanoparticles calculated form BET analysis

is 4315 m^2/g. As can be seen from pore size distributions in **Figure S4,** pore sizes are concentrated in 1nm。



(a)



(b)

Figure S4: (a) N_2 adsorption analysis the BET surface area of MIL-101(Cr) nanoparticles; (b) pore size distribution of MIL-101(Cr) nanoparticles.

Effects of MIL-101(Cr) nanoparticles content on adsorption capacity

To investigate the effects of the content of MIL-101(Cr) nanoparticles on the adsorption capacity, we carried out adsorption experiments at adsorbent dose of 0.25 g/L, initial thiophene concentration of 500 mg/L, and at 25 °C. It can be found from **Figure S5** that the saturated

adsorption capacity initially increased with higher content of MIL-101(Cr). This can be attributed the amount of adsorption sites in MIL-101(Cr)/SA hybrid membrane are enhanced when more amount of MIL-101(Cr) nanoparticles were added to the SA matix. As the content of MIL-101(Cr) nanoparticles arrives at 4.0 wt%, a turning point appears on the curve, and after this point, the adsorption capacity of MIL-101(Cr)/SA hybrid membrane decreases rapidly. This result indicates that under the condition of the content of MIL-101(Cr) nanoparticles of 4.0 wt%, a maximum adsorption sites in MIL-101(Cr)/SA hybrid membrane can be availble for thiophene. Therefore, the MIL-101(Cr)/SA hybrid membrane with MIL-101(Cr) nanoparticles content of 4.0 wt% was used for further adsorption experiments.

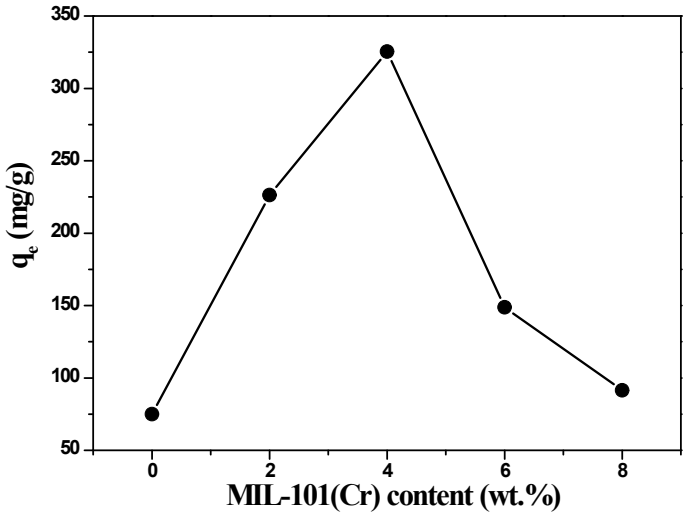


Figure S5: Effect of **MIL-101(Cr)** content on adsorption property