Supporting information for

Effects of mesoporous silica particle size and pore structure on the performance of polymer-mesoporous silica mixed matrix membranes

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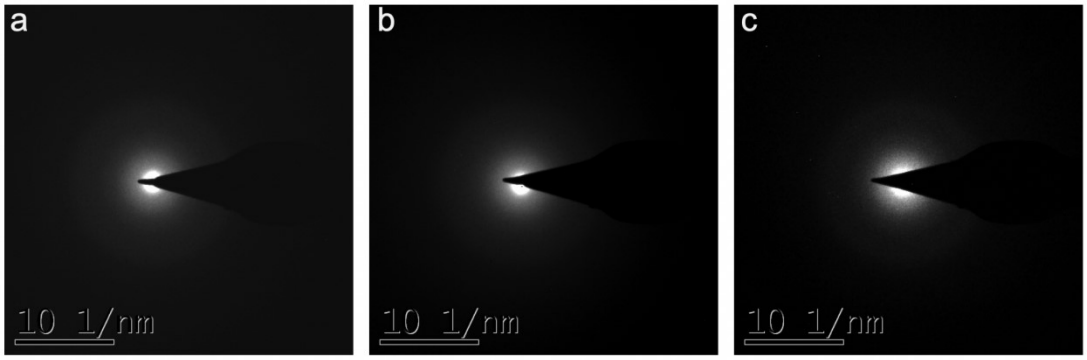

Figure S1. The selected area electron diffraction patterns (SAED) of nm MCM-48 (a), nm MCM-41 (b) and μm MCM-48 (c).

As shown in Figure S1, no SAED patterns could be observed for the samples. This might be attributed to the formation of relatively low-quality mesostructures, as indicated from the XRD results. Moreover, from the technical aspect, the diameter of the selected area is 200 nm. However, the diameters of the nano-sized particles are only around 100 nm. The limited contribution from the reflection domains of mesophase also leads to the absence of the SAED patterns.

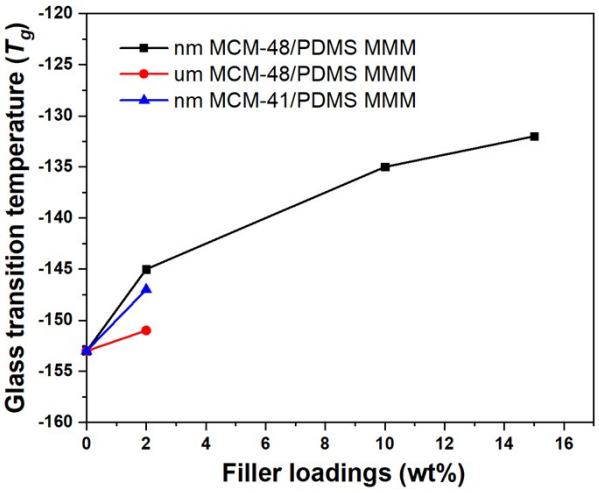

Figure S2. Glass transition temperatures of different MCM/PDMS MMMs.

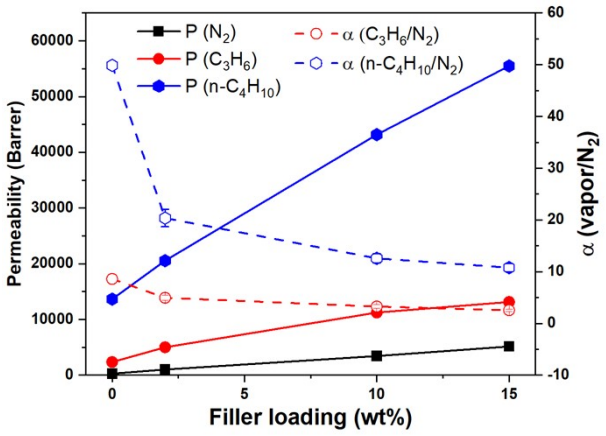

Figure S3. The gas permeabilities and ideal selectivities of vapor/N_2 in the μm MCM-48/PDMS MMMs with different filler loadings.

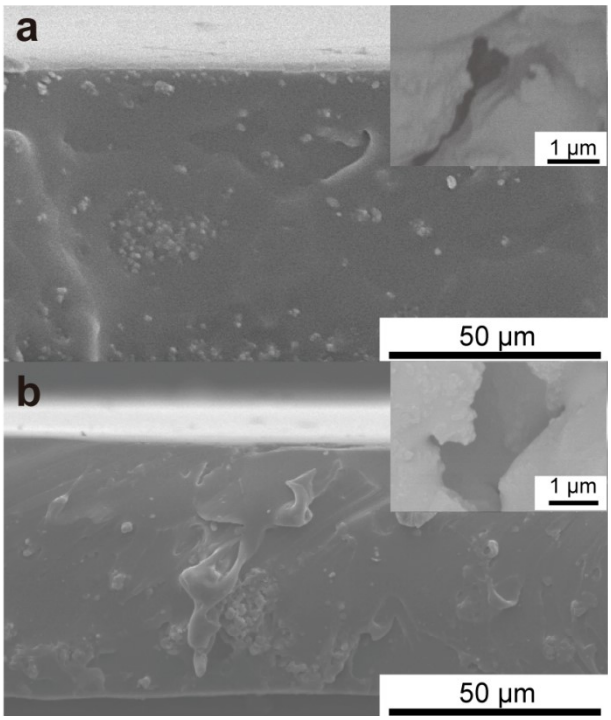

Figure S4. Cross-sectional SEM images of (a) 10 wt.% μm MCM-48/PDMS MMM, (b) 15 wt.% μm MCM-48/PDMS MMM (inserted are the SEM photos with large magnification).

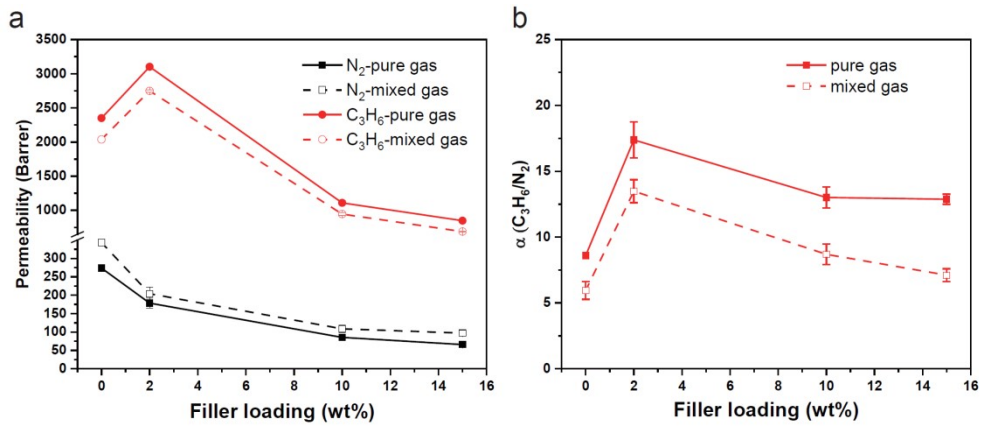

Figure S5. The gas permeabilities and selectivities of C_3H_6/N_2 in pure/mixed gas in the nm MCM-48/PDMS MMMs with different filler loadings.

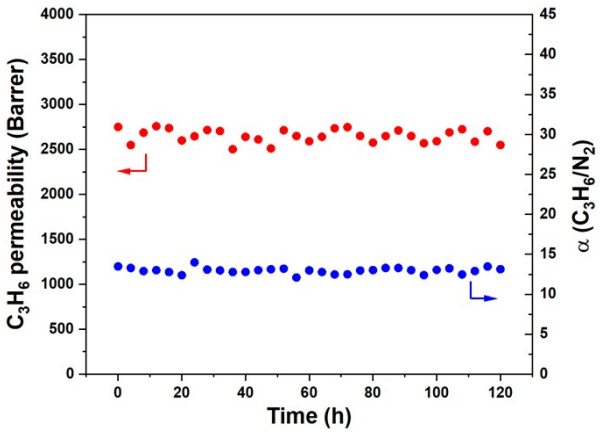

Figure S6. The stability of the 2 wt.% nm MCM-48 MMM for a mixed gas separation.

Table S1. XRD parameters of nm MCM-41, nm MCM-48 and μm MCM-48

Samples	hkl	*d* (nm)	*d* (nm) (Ref.)	Ref.
nm MCM-41	100	3.67	3.98	[1]
	110	2.14	2.29	
	200	1.83	1.98	
nm MCM-48	211	3.08	3.49	[2]
	220	2.66	3.02	
	332	1.64	1.81	
μm MCM-48	211	3.08	3.49	[2]
	220	2.70	3.02	
	332	1.64	1.81	

References

[1] C.T. Kresge, M.E. Leonowicz, W.J. Roth, J.C. Vartuli, J.S. Beck, Ordered mesoporous molecular-sieves synthesized by a liquid-crystal template mechanism, Nature, 359 (1992) 710-712.

[2] Han, S.; Xu, J.; Hou, W.; Yu, X.; Wang, Y., Synthesis of high-quality MCM-48 mesoporous silica using gemini surfactant dimethylene-1,2-bis(dodecyldimethylammonium bromide). J. Phy. Chem. B, 108 (2004) 15043-15048.