Supporting information

Mussel-Inspired Polydopamine Modification of Supports for Facile Synthesis of Zeolite LTA Molecular Sieve Membranes

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Figure S1

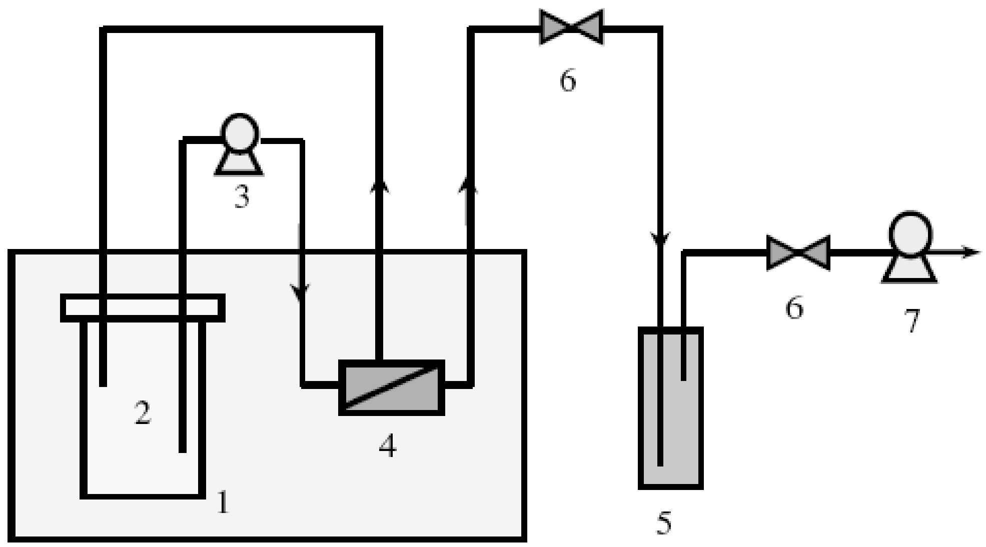

Figure S1. Schematic diagram of experimental apparatus for pervaporation. (1) Water bath, (2) liquid tank, (3) circle pump, (4) permeation cell, (5) cold traps, (6) ball value, (7) vacuum pump.

Figure S2

Figure S2. Top view FESEM image of the zeolite LTA membrane at low magnification prepared on polydopamine modified Al_2O_3 disk.

Figure S3

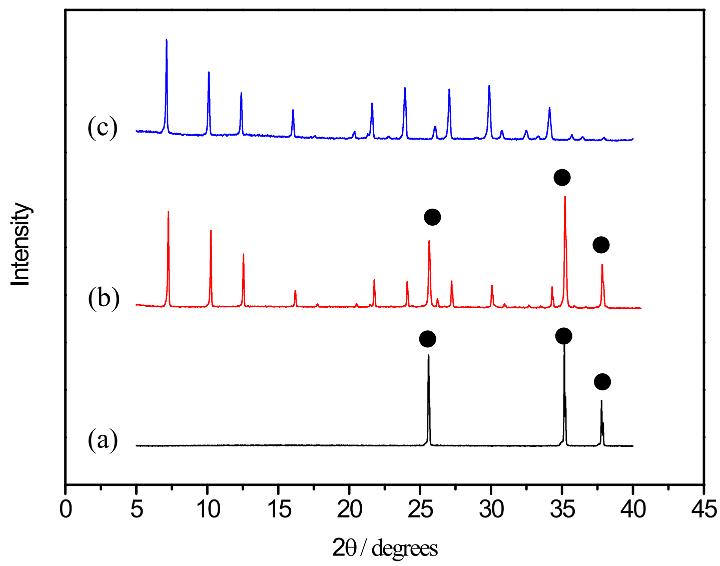

Figure S3. XRD patterns of the Al_2O_3 support (a), zeolite LTA membrane prepared on polydopamine functionalized Al_2O_3 support (b), and zeolite LTA powder (c). (●): Al_2O_3 support, (not marked): zeolite LTA.

Figure S4

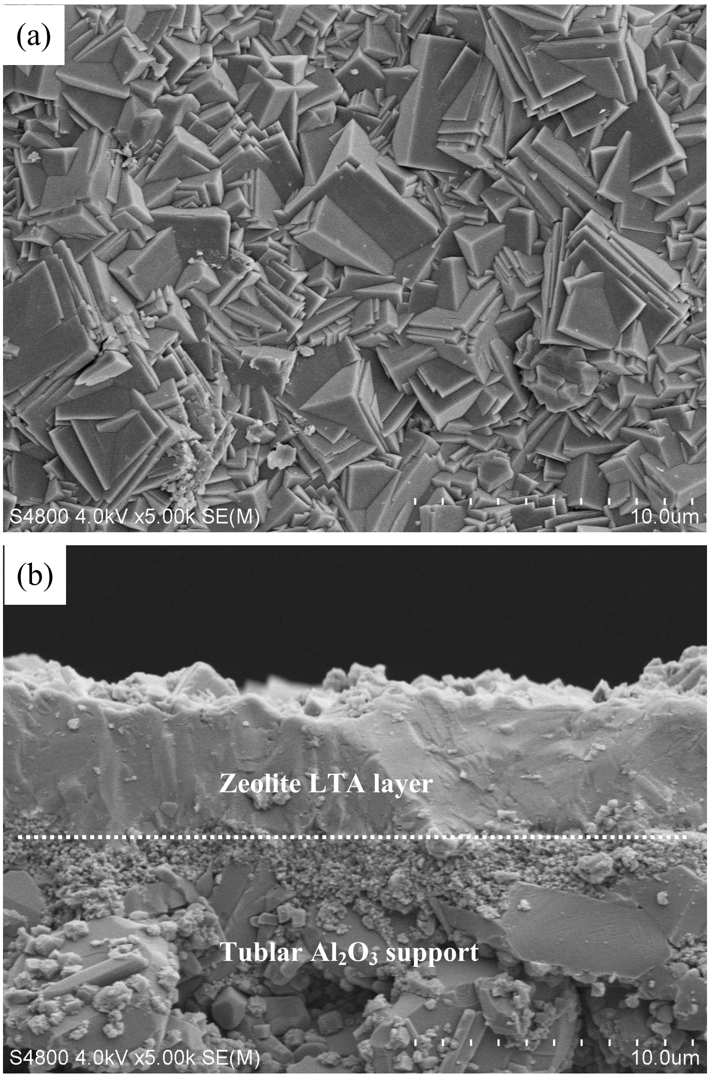

Figure S4. Top view (a) and cross-section FESEM images of the zeolite LTA membrane prepared on polydopamine functionalized α-Al_2O_3 tubes.

Figure S5

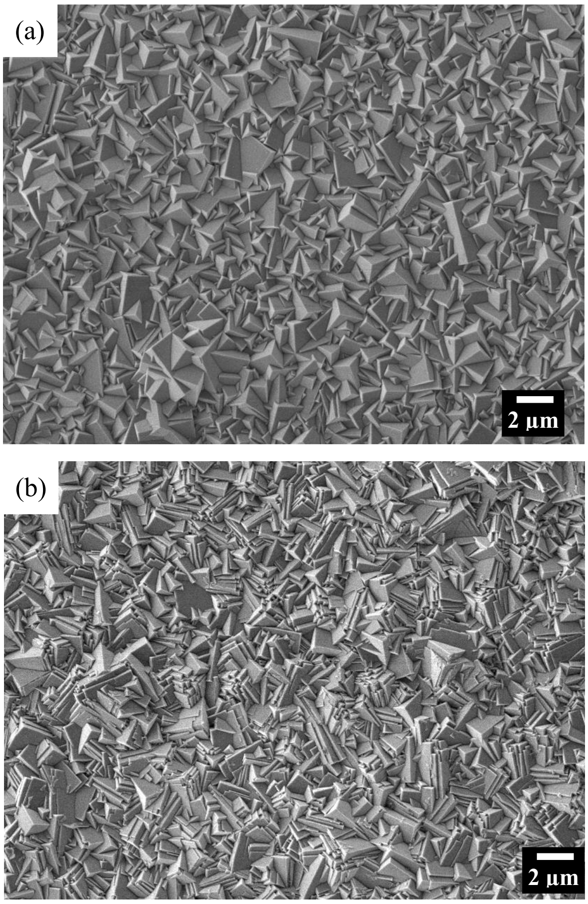

Figure S5. Top view FESEM images of the zeolite LTA membrane prepared on PDA-modified glass plate (a) and stainless steel disk (b).

Figure S6

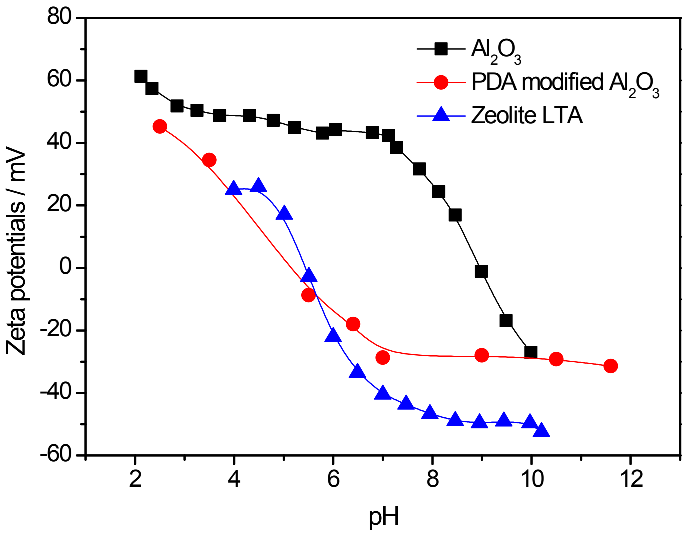

Figure S6. Zeta potential of Al_2O_3 (A. Huang, et al, *Chem. Mater.* **2010**, *22*, 4353), PDA modified Al_2O_3 and zeolite LTA particles (A. Huang, et al, *Chem. Mater.* **2010**, *22*, 4353) suspended in water as function of pH.

Figure S7

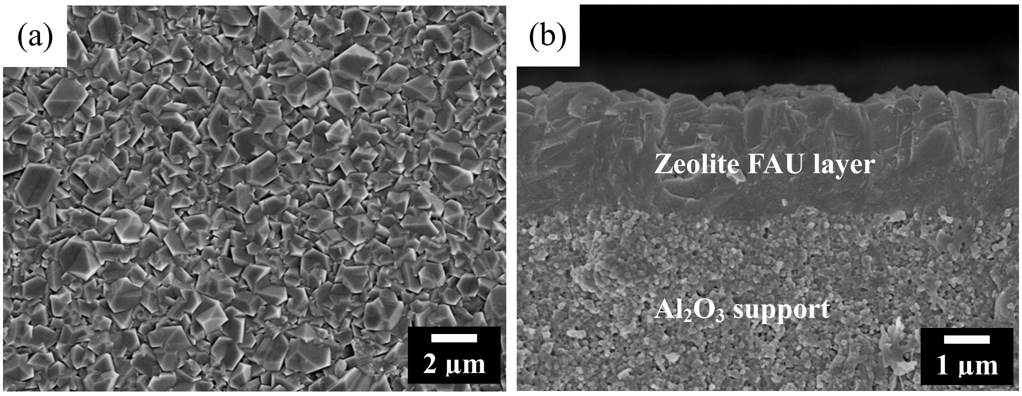

Fig. S7. Top view (a) and cross-section (b) FESEM images of the zeolite FAU membrane prepared on PDA-modified Al_2O_3 disks.

For synthesis of the zeolite FAU membrane on the PDA-modified α-Al_2O_3 disk, a clear synthesis solution with the molar ratio of $70Na_2O$: $1Al_2O_3$: $20SiO_2$: $2000H_2O$, was prepared by mixing aluminate solution and silicate solution at room temperature according to the procedure reported elsewhere [A. Huang, N. Wang and J. Caro, *J. Membr. Sci.* 2012, **389**, 272]. The PDA-modified or non-modified α-Al_2O_3 disks were horizontally placed face down in a Teflon-lined stainless steel autoclave, and then the synthesis solution was poured into. After in-situ growth for 24 h at 348 K, the solution was decanted off and the membrane was washed with deionized water several times, and then dried in air at 383 K over night for characterization or permeation measurement.

Figure S8

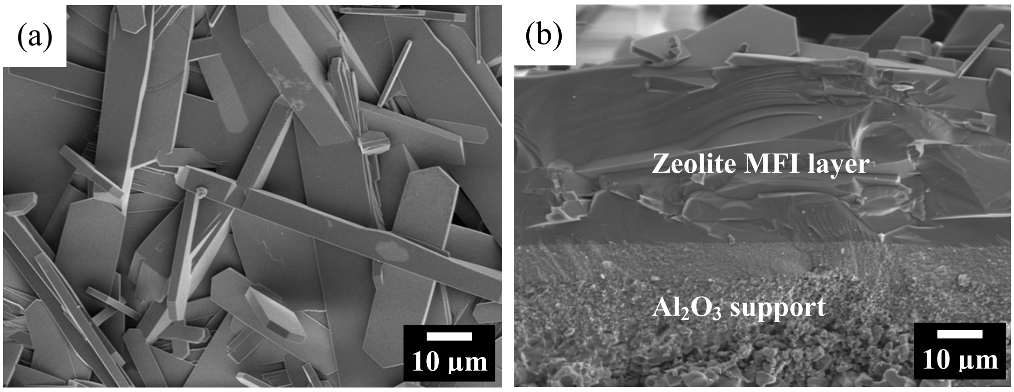

Fig. S8. Top view (a) and cross-section (b) FESEM images of the zeolite MFI membrane prepared on PDA-modified Al_2O_3 disks.

For synthesis of the zeolite MFI membrane on the PDA-modified α-Al_2O_3 disk, a clear synthesis solution with the molar ratio of 1TBABr : 2NaOH : $10SiO_2$: $600H_2O$, was prepared by mixing TBABr, NaOH and silicate solution in water at room temperature according to the procedure reported elsewhere with minor modification [H. Chen, C. Song and W. Yang, *Microporous Mesoporous Mater.* 2007, **102**, 249]. The PDA-treated or non-treated α-Al_2O_3 disks were horizontally placed face down in a Teflon-lined stainless steel autoclave, and then the synthesis solution was poured into. After in-situ growth for 48 h at 453 K, the solution was decanted off and the membrane was washed with deionized water several times, and then dried in air at 383 K over night for characterization or permeation measurement.

Table S1

Table S1. Comparisons of the pervaporation properties of the as-synthesized zeolite LTA membrane prepared in this study with literature data.

Supports	Seeding	Mixtures (A / B)	Concentration (A wt%)	T（K）	Flux（kg/ m^2h）	$\alpha_{A/B}$	References
Mullite tube	Yes	H_2O/EtOH	10	348	2.08	42000	S1
ZnO_2 tube	No	H_2O/i-PrOH	10	343	0.5	5000	S2
α-Al_2O_3 tube	Yes	H_2O/i-PrOH	5	343	1.67	10000	S3
α-Al_2O_3 tube	No	H_2O/EtOH	5	318	0.23	8300	S4
α-Al_2O_3 tube	No	H_2O/i-PrOH	5	343	1.02	9481	S5
α-Al_2O_3 tube	No	H_2O/i-PrOH	5	343	1.49	3781	S6
α-Al_2O_3 tube	Yes	H_2O/EtOH H_2O/i-PrOH	5	393	4.3 5.6	5600 6000	S7
TiO_2 coated stainless-steel	No	H_2O/EtOH	5	318	0.86	54000	S8
α-Al_2O_3 tube	Yes	H_2O/EtOH	10	348	5.6	5000	S9
α-Al_2O_3 tube	Yes	H_2O/EtOH	2.65	333	2.1	2140	S10
α-Al_2O_3 tube	No	H_2O/i-PrOH	5	343	1.67	4700	S11
α-Al_2O_3 tube	No	H_2O/EtOH	10	338	0.51	10000	S12
Polymer-zeolite CHFs	No	H_2O/EtOH	10	348	9.2	>10000	S13
α-Al_2O_3 tube	Yes	H_2O/EtOH	10		2.6	>10000	S14
α-Al_2O_3 tube	No	H_2O/EtOH	5	333 348 358 373	2.06 2.58 3.28 4.13	>10000 >10000 >10000 >10000	This study

References

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