Electronic Supplementary Information

Tuning molecular sieving channels of layered double hydroxides membrane with direct intercalation of amino acids

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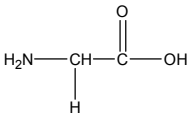
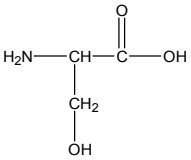
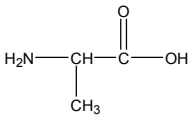
Table S1. Properties of intercalated amino acids

Chemical name	Glycine	Serine	Alanine
Chemical formula			
Hydrophilic/hydrophobic property	Hydrophilic	Hydrophilic	Hydrophobic
Molecular weight	75.07	105.09	89.09

Crystal cells with different intercalation in molecular simulation

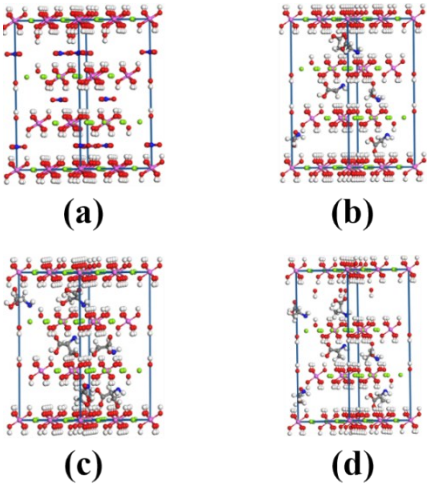


Figure S1. A schematic diagram of LDH nanosheets with different amino acid molecular intercalation. (a) MgAl-LDH: 12.55 Å × 12.55 Å × 24.04 Å, (b) Gly-MgAl-LDH: 12.55 Å × 12.55 Å × 26.20 Å, (c) Ser-MgAl-LDH: 12.55 Å × 12.55 Å × 22.45 Å, (d) Ala-MgAl-LDH: 12.55 Å × 12.55 Å × 29.01 Å.

Schematic diagram of nanofiltration process

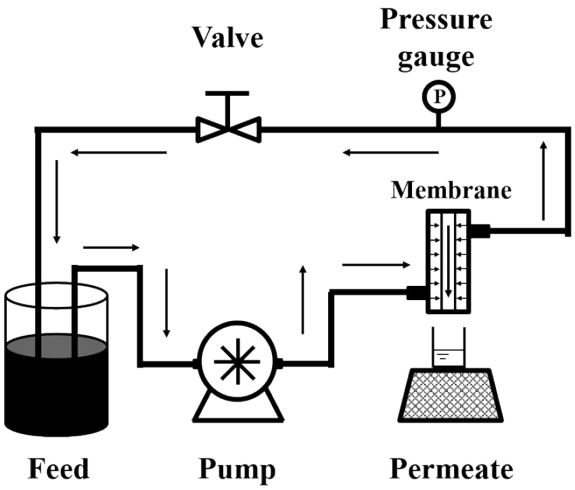


Figure S2. The schematic diagram of the cross-flow filtration device.

SEM and TEM analyses of the MgAl-LDH and amino acid intercalated MgAl-LDH nanosheets

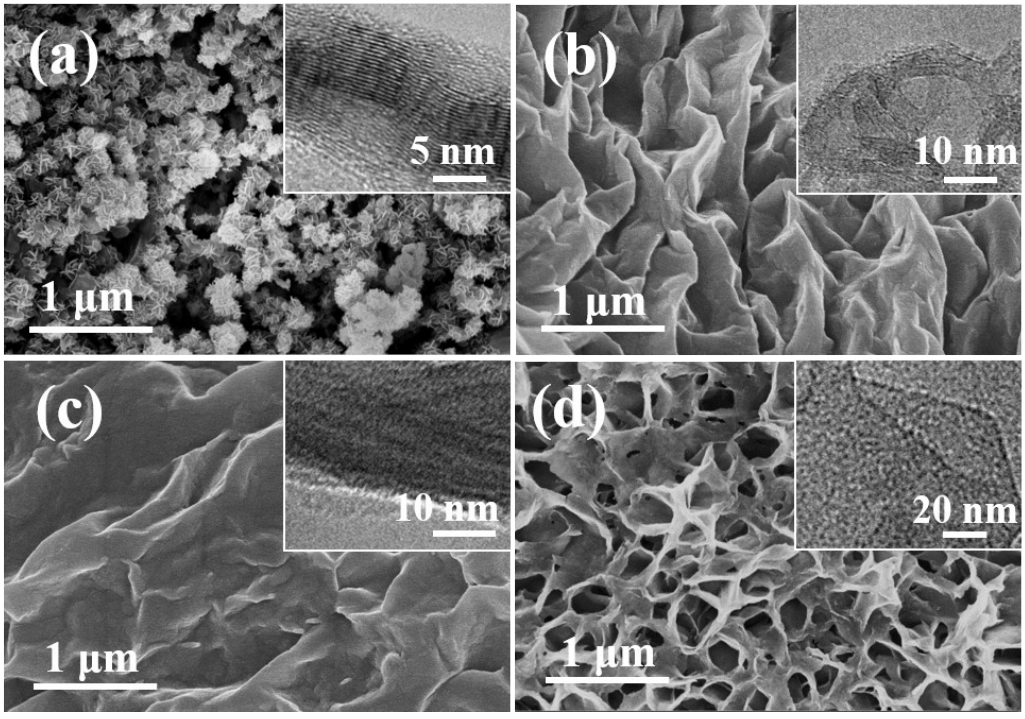


Figure S3. The SEM and TEM images of (a) MgAl-LDH, (b) Gly-MgAl-LDH, (c) Ser-MgAl-LDH, (d) Ala-MgAl-LDH. (Insets are TEM images)

EDX analyses of the Gly-MgAl-LDH/PEI membrane

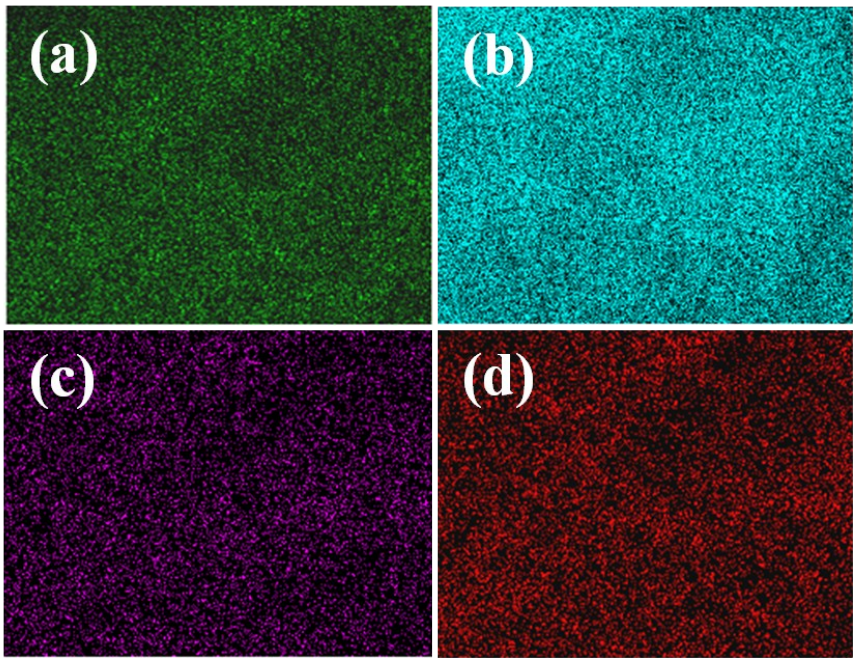


Figure S4. EDX analyses on the surface of the Gly-MgAl-LDH membrane. (a) magnesium, (b) aluminum, (c) nitrogen, (d) carbon.

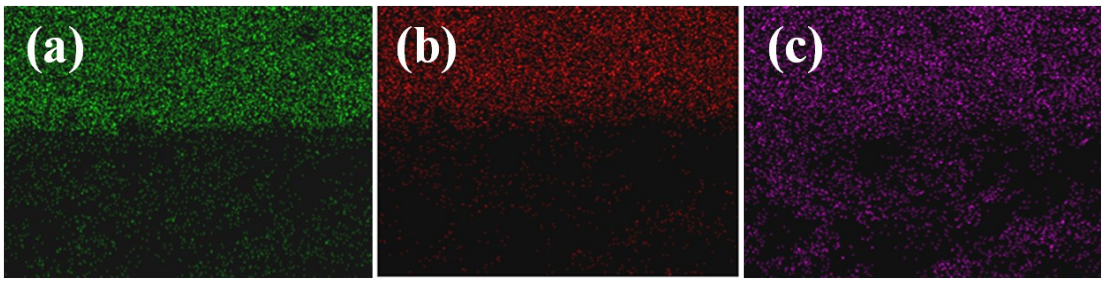


Figure S5. EDX analyses on the cross-section of the Gly-MgAl-LDH membrane. (a) magnesium, (b) carbon, (c) nitrogen.

Characterization of atomic force microscope

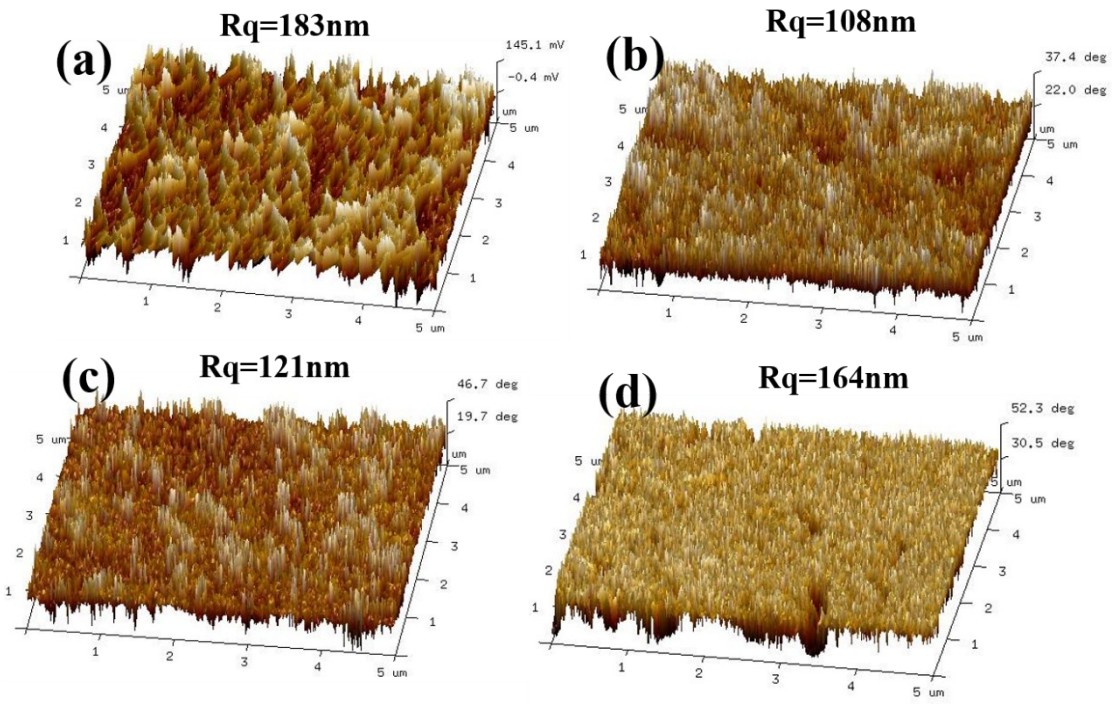


Figure S6. AFM images of (a) MgAl-LDH membrane, (b) Gly-MgAl-LDH membrane, (c) Ser-MgAl-LDH membrane, (d) Ala-MgAl-LDH membrane.

Characterization of SEM under different reaction conditions

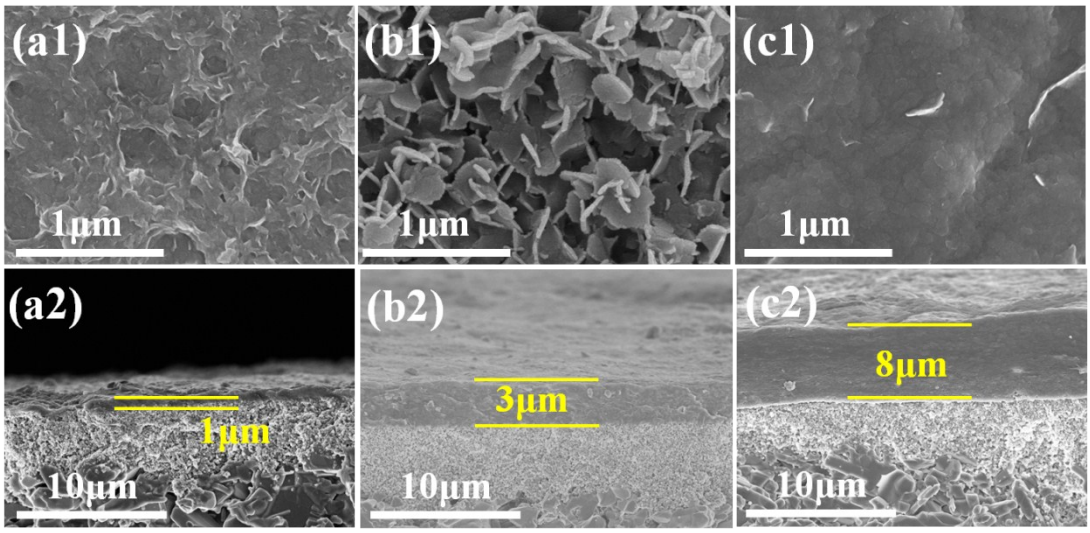


Figure S7. SEM images of the Gly-MgAl-LDH membrane with reaction temperature of (a) 80 °C, (b) 100 °C, (c) 140 °C.

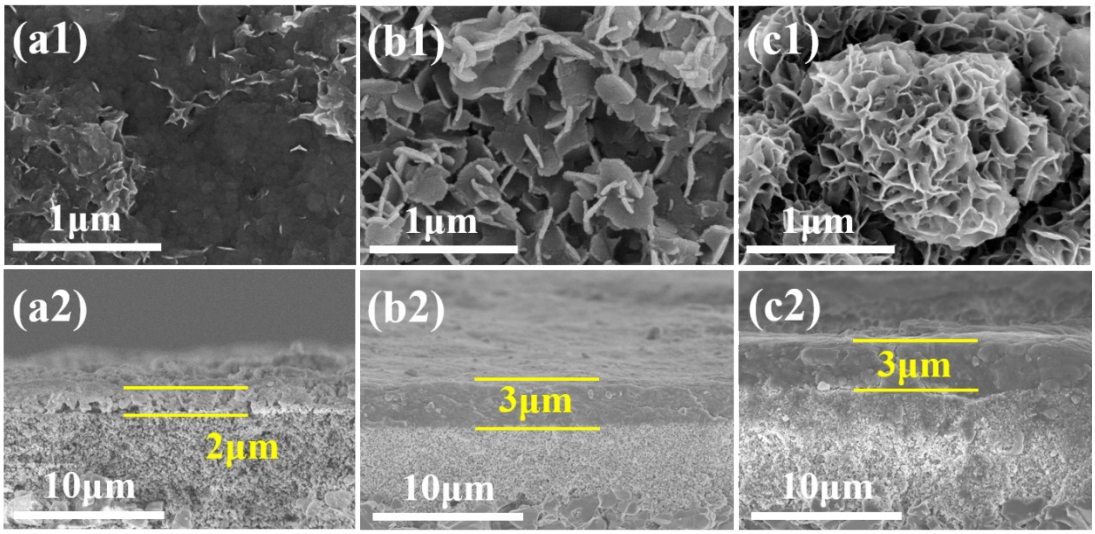


Figure S8. SEM images of the Gly-MgAl-LDH membrane with different hydrothermal time. (a) 20 h, (b) 24 h, (c) 28 h.

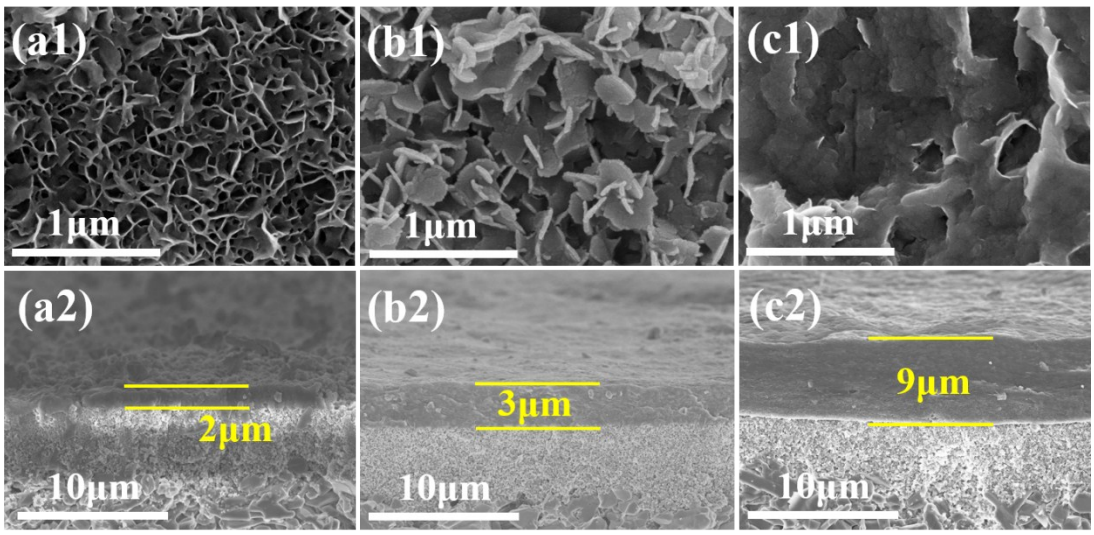


Figure S9. SEM images of the Gly-MgAl-LDH membrane with different concentration of precursor. (a) 0.3 mol/L, (b) 0.5 mol/L, (c) 0.7 mol/L.

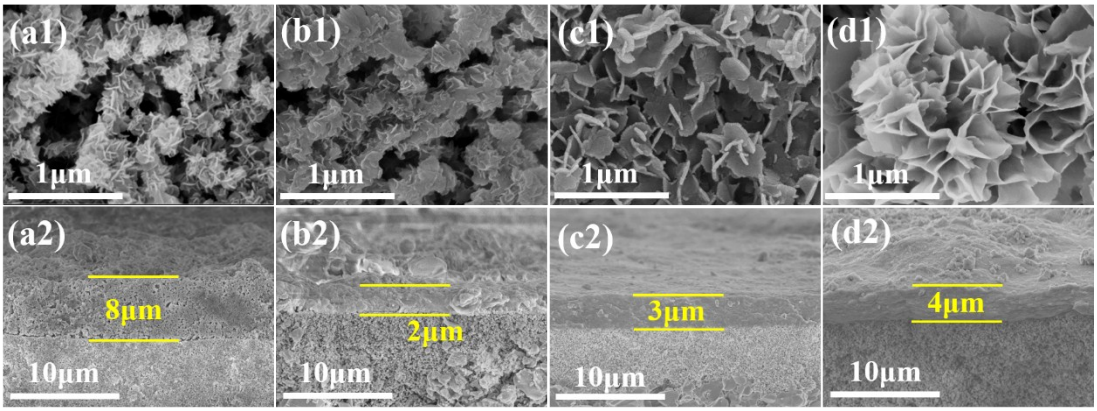


Figure S10. SEM images of the Gly-MgAl-LDH membrane with PEI concentration. (a) none, (b) 0.05 wt%, (c) 0.25 wt%, (d) 0.45 wt%.

Table S2. Comparison with other membranes for dye aqueous solution

Membrane	Dye	Rejection (%)	Permeance ($Lm^{-2}h^{-1}MPa^{-1}$)	Ref
ATR-PIP-TMC/PA	Orange GII	94.7	229.5	1
TiO_2-Dolapix-PVA/ ceramic	Alizarin red	99	140	2
PVC/TPU	Coomassie Brilliant Blue	100	139.25	3
PEI-PAA	Congo red	100	55	4
PDA-rGOC3/PAN	Reactive blue 2	99.4	228	5
BDSA-TMC/PSf	Congo red	99	82	6
PVDF/Brij-58	Reactive red 141	90	52	7
PDA/PEI	Rhodanile blue	98	262	8
NMG-PDA	Acid red 18	99	102.9	9
ZIF-8-PEI/PAN	Methyl blue	99.6	330	10
SG@GO/ ceramic	Eriochrome black T	98	330	11
TA/GOQDs/PAN	Congo red	99.8	116.65	12
modified PEI/PAN	Methyl blue	97.3	255	13
PMIA/GO/PAN	Acid Red	91	156.5	14
mZIF-8/PAN	Reactive black 5	99	116.25	15
PGMs/PAN	Methyl orange	97.5	110	16
GO/BPEI/PC	Brilliant blue	94.8	20.1	17
Zwitterion/PES	Reactive Red 49	86.7	200.5	18
TiO_2/AAO	Methylene blue	96	30	19
BDSA/PSf	Congo Red	99	166	20
zwitterionic /PSf	Orange GII	90.6	132	21
GO-PSBMA /PSf	Reactive Black 5	99.2	119.8	22
PA/ZIF-8/PSf	Congo red	99.8	271	23
YSZ/ceramic	fluorescent brightener	99	280	24
G-CNTms/PVDF	Direct Yellow	99	113	25
GLY-LDH/PEI/ ceramic	Congo Red	99.16	836.64	This work
GLY-LDH/PEI/ ceramic	Eriochrome black T	98.55	566.8	This work
GLY-LDH/PEI/ ceramic	Rose Bengal	95.26	374.64	This work
GLY-LDH/PEI/ ceramic	Acid Fuchsin	96.77	105.04	This work
GLY-LDH/PEI/ ceramic	Methyl blue	99.62	106.64	This work

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