Supplemental Information

Membrane Coating Methods.

Attachment of zeolite procedure using UV (Attachment – UV method). Faujasite zeolite nano particles were made using the following procedure. 1.1 g of $Na_2Al_2SO_4$ (Sigma Aldrich) in 10 mL of water was mixed with 2.4 g of NaOH and 18.1 g of Na_2SiO_3 solution (Sigma Aldrich) were chilled in an ice bath for 30 min. The $Na_2Al_2SO_4$ mixture was added slowly added to Na_2SiO_3. After aging for 24 hours at room temperature, the mixture was freeze dried and then crystalized for 2 days at 50 °C. Solution was centrifuged, washed, and dried to produce a zeolite powder.

PSf membranes were prepared as described by Binahmed et al.[2] Zeolite was attached to the membranes using a similar procedure as described by Kulak et al.[4] Briefly, zeolite was dried for 24 hours at 100 °C using a Schlenk Line (100 millitorr) and treated with 3-aminoproplytriethoxysilane (APTES) (2 mM) (Sigma Aldrich) in toluene for 1 hour at 70 °C under nitrogen. PSf membranes were irradiated with a UV lamp (Spetroline Model EF-160C) for 15 seconds to create carboxylic groups on the membrane surface and treated with [3-(2,3epoxypropoxylpropyl]-trimethoxysilane (GLYMO) (2 mM) (Sigma Aldrich) in iso-octane for 1 hour at room temperature under nitrogen.

The treated zeolite was dried at 70 °C overnight and resuspended in iso-octane and applied to the treated PSf membrane for 1 hour while mixing. Coated membranes were rinsed and sonicated for 20 seconds to remove non-attached particles. Membranes were stored at 4 °C in deionized (DI) water.

Attachment of zeolite procedure using UV and poly(acrylic acid (PAA) (Attachment – AA/UV method). The previous procedure was modified to apply 10% acrylic acid (AA) solution from stock 99% AA (Sigma Aldrich) in MilliQ to the PSf membrane immediately after membrane oxidation with

UV exposure for the growth of PAA and enhance the coverage of carboxylic groups on the membrane surface.[3] AA (10%) was applied for 5 minutes and immediately rinsed with MilliQ water. A more detailed procedure is described in Wuolo-Journey et al.[3] The procedure continued as described in the attachment procedure using UV.

Attachment of zeolite procedure using EDC-NHS (Attachment – EDC/NHS). Beginning with UV/AA treatment, this procedure then uses 4 mM 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide hydrochloride (EDC) (Sigma Aldrich) and 10 mM N-hydroxysuccinimide (NHS) (Sigma Aldrich), adjusted to pH 5 with 10 mM MES (Sigma Aldrich) supplemented with 0.5 M NaCl. This solution is applied to PSf membrane while mixing at ambient conditions for one hour.[3, 5] Membrane was then rinsed and zeolite applied as described above.

Attachment of zeolite procedure using polydopamine coating (Attachment – PDA). PSf membranes were prepared and stored as described earlier.[2] Dopamine solution was prepared using 4 g of 3,4-dihydroxyphenylalanine (DOPA) (Sigma Aldrich) in 1 L of Trizma buffer (10 mM) (Sigma Aldrich).[2, 8] Once mixed, 50 mg of zeolite, prepared as described above, was added to the solution. The pH was adjusted to 8.5 using 1 M NaOH. Dopamine solution was immediately transferred to the membrane to initiate PDA deposition for 15 minutes while mixing. Membranes were then immediately rinsed thoroughly with MilliQ and stored in MilliQ at 4 °C.

Embedment of zeolite into PSf membranes (Embedment). PSf membranes were prepared as described previously.[2] 50 mg of zeolite nano powder (prepared as described previously) was added directly to the dope solution after solution was stored overnight to remove air bubbles. After the membranes were cast, they were stored in MilliQ at 4 °C until use.

Growth of zeolite on alumina hollow fiber membranes (Growth). Growth of faujasite zeolite on alumina hollow fiber membranes (0.7 mm diameter) is described in previous work.[7] Briefly, raw fibers of 38.0% N-Methyl-2-pyrrolidone (NMP), 6.8% polyethersulfone (PES), 54.7% Al_2O_3, and 05% polyvinylpyrrolidone (PVP) were sintered to make alumina hollow fiber membranes. Zeolite growth on the membrane surface occurred by immersing in a solution of 7.7 M NaOH, colloidal silica (Ludox TM-40, Sigma Alrich), and 0.15 of aluminum for 24 hours at 75 °C. Plain and zeolite-coated membranes were stored dry in sterile containers at ambient conditions until use.

Table S1. Synthetic wastewater components in mg per liter for CFTR and ACFTR

	CFTR	ACFTR	
NH_4Cl	133.75	133.75	mg
$NaNO_2$	103.5	0	mg
Magnesium Phosphate Dibasic Trihydrate	25	25	mg
Potassium Phosphate Tribasic	20	20	mg
$NaHCO_3$	275	275	mg
Sodium acetate	221	221	mg
Bacteriological peptone	24	24	mg
Dry meat extract	12	12	mg
Potato starch	42	42	mg
Low fat milk powder	50	50	mg
Glycerine	34	34	mg

Table S2. Synthetic wastewater components in mg per liter for MFTR and Bioavailability Test

	MFTR	Bioavailability Test	
NH_4Cl	133.75	0	mg

$NaNO_2$	0	236.4	mg
KH_2PO_4	27.2	27.2	mg
$KHCO_3$	500	500	mg
Trace solution 1	1	1	mL
Trace solution 2	1	1	mL
Mg solution	1	1	mL
Ca solution	1	1	mL

†Trace solutions are detailed in Peterson et al.[22]

Table S3. Constants of isotherm equations

$\mathbf{q_e}$	Ammonium sorbed per unit mass of membrane or carrier
$\mathbf{q_{max}}$	Maximum sorption capacity
k	Adsorption equilibrium constant
$\mathbf{c_f}$	Concentration of ammonium in solution
$\mathbf{k_f}$	Fruendlich constant
n	Emprical isotherm constant

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