

Supporting Information

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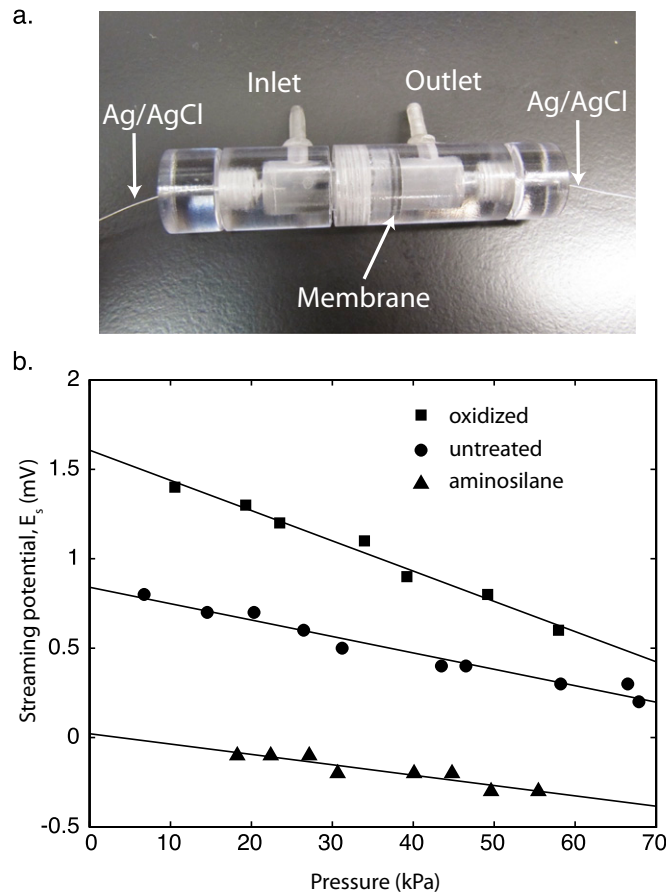


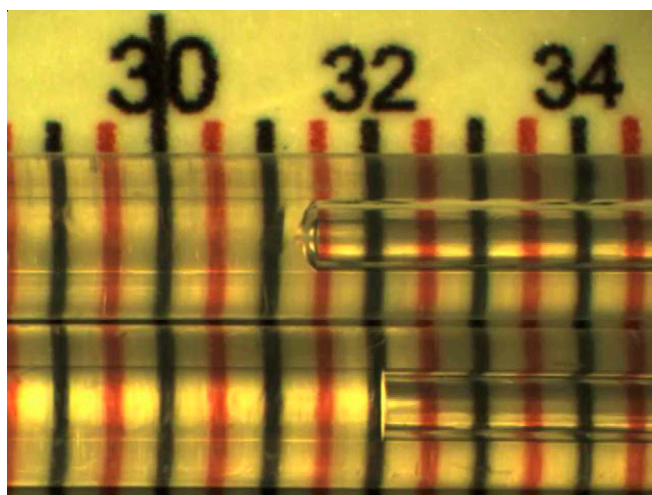
Fig. S1. Streaming potential measurements. (A) An image of the polycarbonate device used for the measurements. Ag/AgCl electrodes are threaded into a small piece of silicon cording and are compressed into the end of each chamber with polycarbonate screws. Each chamber is filled with KCl and the membrane chip is recessed into one of the chambers between two O-rings. The chambers are threaded together, and excess KCl leaves through the pressure inlet/outlet. A KCl reservoir is attached to the pressure inlet and pressurized by compressed N_2 . The potential difference between the two chambers is measured with a voltmeter. (B) Plot of streaming potential vs. pressure data for native and modified membranes. The offset in the y intercept is caused by slight differences in Ag/AgCl wires and chamber assembly. The slope of these curves can be used to determine the zeta potential using Eq. 6. Note that in solving for the zeta potential we use an average pore radius for α . This is because the streaming potential relationship is not additive and cannot be easily determined for a pore distribution.

Table S1. Electroosmotic flow through 15- and 30-nm pnc-Si membranes under back pressure

Voltage, mV	Q_{\max} nL/min		P_{\max} kPa		Power, mW	
	15 nm	30 nm	15 nm	30 nm	15 nm	30 nm
1,500	1,105.24	1,062.02	1.80	1.50	1.32	1.28
1,250	910.74	744.03	1.46	1.30	0.92	0.89
1,000	583.49	517.50	1.26	1.03	0.58	0.57
750	351.95	296.38	0.94	0.69	0.32	0.31
500	129.66	77.80	0.53	0.34	0.14	0.14
250	29.64	0.00	0.34	0.00	0.03	0.03

Table S2. Hydraulic permeability of pnc-Si membranes

Thickness, nm	Porosity, %	Pore diameter, nm	Permeability,	EO flow, $\mu\text{L}/\text{min}$
			$\mu\text{L}\cdot\text{min}^{-1}$ $\text{PSI}^{-1}\cdot\text{cm}^{-2}$	
15	8.1	21.1 ± 4.3	1,900	0.64
30	7.5	38.9 ± 8.2	2,600	0.64



Movie S1. Porous nanocrystalline silicon prototype electroosmotic pump (EOP) pressurizing fluid through capillary tubing in real time. The movie focuses on two 1- μm -diameter capillary tubes attached to the inlet and outlet ports of the EOP. The voltage is switched between +2.05 V and -2.05 V every 30 s. Initially, the fluid is pumped through the upper capillary tube, but once the polarity is switched, the fluid reverses direction and flows through the lower capillary tube.

[Movie S1](#)