Supporting Information for:

Electrolyte Gradient-Based Modulation of Molecular Transport through Nanoporous Gold Membranes

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Figure S1: Absorbance and Potential Difference Measurements

(a) Raw absorbance data and (b) measured electric potential over time for BS⁻ transport through NPG with 1000 mM NaCl in the feed reservoir. Sink reservoir NaCl concentrations are presented in the legend, in mM. The absorbance data maintains its slope and the average electric potential does not shift during the course of the experiment allowing the assumption that the salt gradient is still present. Data collected during the initial 5 minutes was discarded to ensure that any variability during the initial equilibration of the membrane was omitted from analysis.



Figure S2: EDX Analysis of Au Samples

EDX spectra of (a) a de-alloyed NPG sample showing complete removal of all less noble metals and (b) a 10 karat white gold precursor alloy sample.



Figure S3: Surface Area Analysis

Cyclic voltammogram of a representative NPG sample in 0.5 M H₂SO₄ at 5 mV s⁻¹. Potential is vs a mercury-mercurous sulfate electrode (MSE).



Figure S4: Potential Difference Measured Across NPG

The raw potential difference across NPG as measured with [Feed] > [Sink] (red), [Feed] < [Sink] (green), and [Feed] = [Sink] (blue) gradient conditions for (a) NaCl, (b) KCl, and (c) MgCl₂. Note that the no gradient condition still demonstrates a large potential difference, even in the absence of a salt gradient. This was due to the contribution of BS⁻ to the ΔE . This fitted data was subtracted from the 1000 mM Feed and 1000 mM Sink data to calculate the transference numbers.



Figure S5: Potential Difference Measured Under No Salt Gradient

The benzene sulfonate contribution to the measured potential difference across NPG for NaCl (red), KCl (green), and MgCl₂ (blue). The pyridine contribution in NaCl is also provided (cyan). It was assumed that the potential difference measured in the no gradient conditions was solely due to the presence of benzene sulfonate in the feed reservoir. The measured values for the no salt gradient condition were fit for subsequent subtraction from the measured ΔE for the 1000 mM Feed and 1000 mM Sink salt gradients.



Figure S6: Molecular flux with weakly adsorbing electrolytes

 BS^- transport through NPG with (a) NaClO₄ and (b) NaF background electrolyte as measured by UV absorption in sink reservoir over time. (c) Potential difference measured across NPG with [Feed] = [Sink]. (d) Corrected potential difference across NPG as measured under the [Feed] > [Sink] and [Sink] > [Feed] gradient conditions.

Table S1: β values

 β values as calculated from the diffusion coefficients. Note that KClO₄ and Mg(ClO₄)₂ were not used in the present study.

Ion (D = 10^{-5} cm ² s ⁻¹)	Cl ⁻ (2.032)	ClO ₄ - (1.792)
Na ⁺ (1.344)	-0.204	-0.143
K ⁺ (1.957)	-0.019	0.044
¹ ⁄2 Mg ²⁺ (0.706)	-0.484	-0.435