Electronic Supplementary Material (ESI) for Environmental Science: Processes .
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Electrochemical Mineral Scale Prevention and Removal on Electrically Conducting Carbon Nanotube – Polyamide Reverse Osmosis Membranes

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Supporting Materials

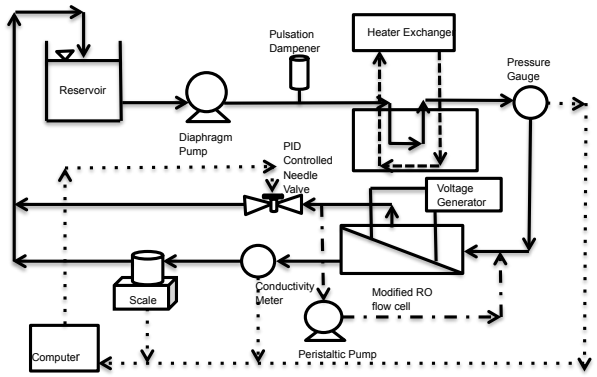

Figure S1. System diagram: solid lines represent water flow; dotted lines represent computer data flow; dashed line represent membrane flushing flows.

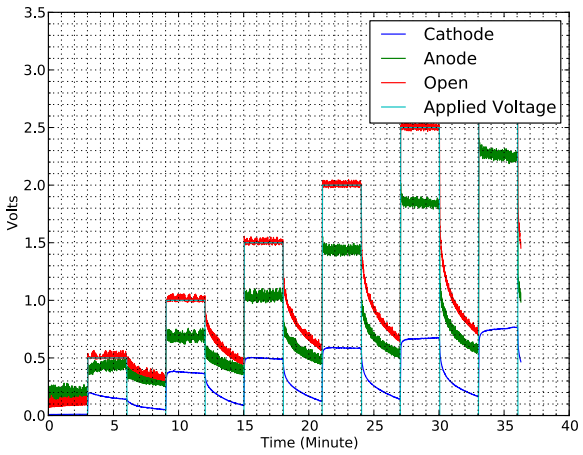

Figure S2. Membrane surface potential (as anode or cathode) vs. a Ag/AgCl reference electrode as a function of applied electrical potential; the red line represents the applied potential; the green line represents the surface potential when the membranes is an anode; the blue line represents the surface potential when the membrane is used as a cathode.

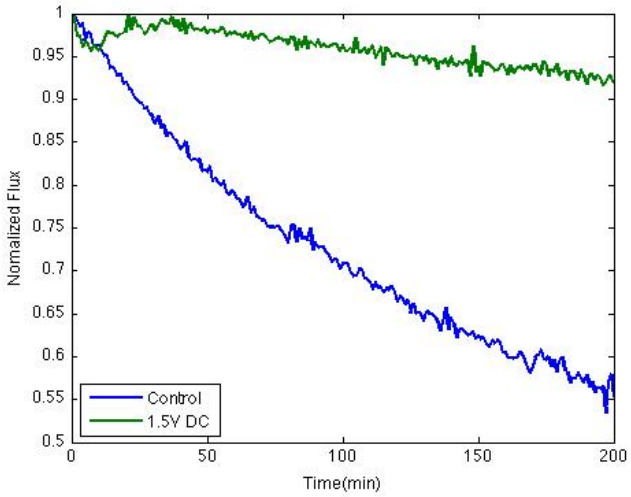

Figure S3. Impact of electrical potential on $CaSO_4$ scale formation, when an in-line 0.5 μm filter was used to remove suspended particulate matter from the recirculated retentate.

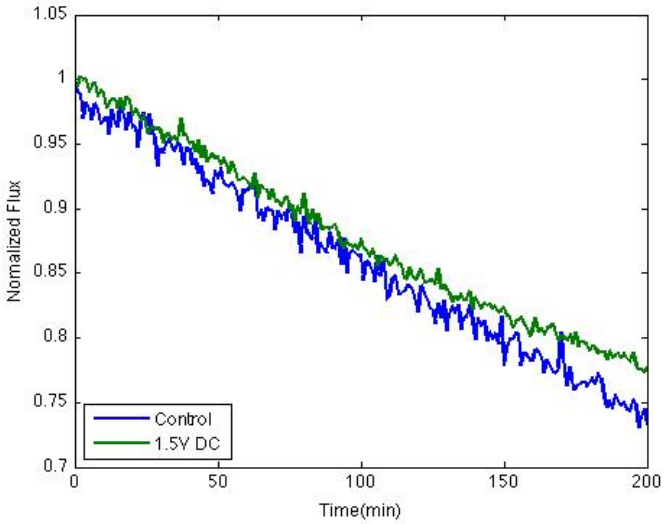

Figure S4. Impact of electrical potential on $CaSO_4$ scale formation, when no in-line 0.5 μm filter was used.

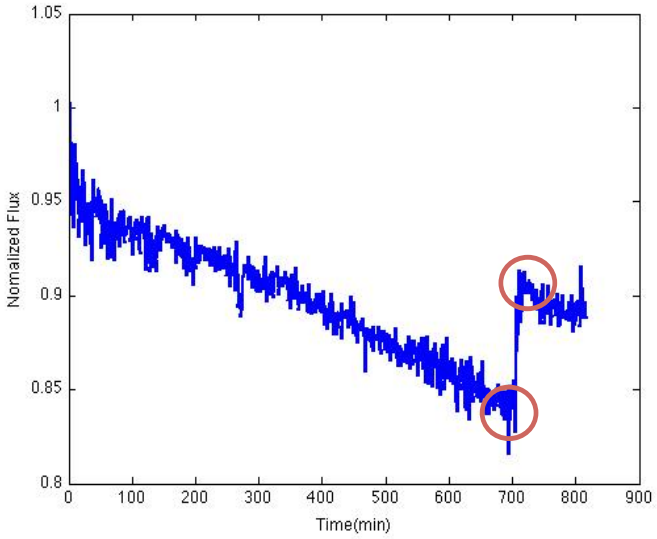

Figure S5. $CaCO_3$ Scaling experiment: the first red cycle indicates when 2.5 V DC were applied for 10 minutes; the second red circle indicates when the voltage was turned off.

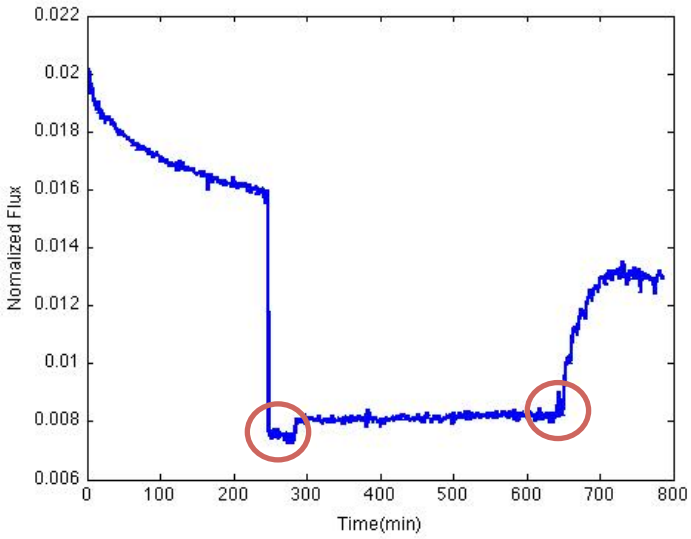

Figure S6. $CaCO_3$ scaling experiment: the first red cycle indicates decrease pressure to 400 psi (operation pressure of scaling experiment is 550 psi in the beginning of the experiment, up to approximately 240 min.) together with rinsing with deionized water, which resulted in very little flux recovery. The second circle indicates the point where 2.5 V DC were applied to the membrane surface for 10 minutes (membrane as anode).

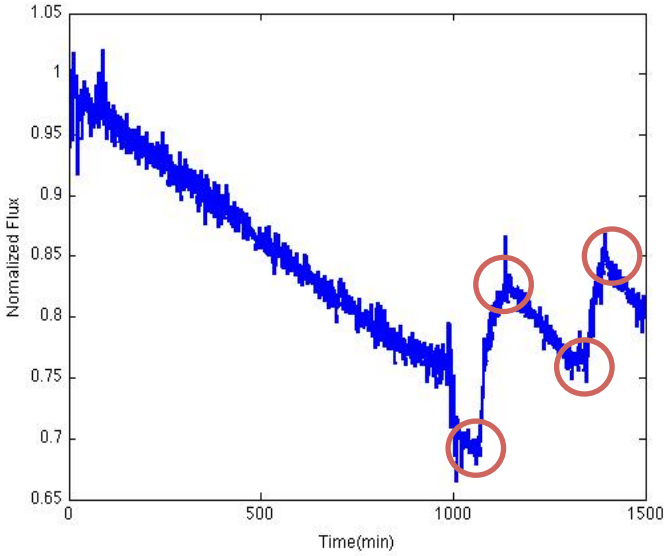

Figure S7. $CaCO_3$ scaling experiment: the 1st and 3rd red cycle indicated applied 2.5V DC on the membrane surface, the 2nd and 4th stop applied the voltage. The cross flow is 4 cm/s in cell and pressure is 400 psi.

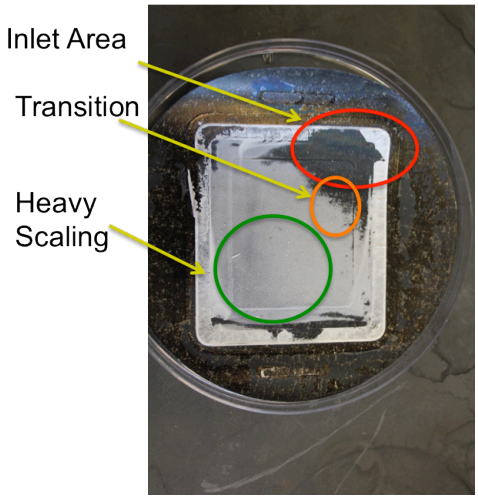

Figure S8. Three different zones were evident after CaSO4 scaling experiment; an area near the inlet where no scaling was evident, likely due to turbulent conditions, a transition zone, and a heavy scaling zone. The image above was taken from one of the control experiments, where no electrical potential was applied to the membrane surface.