**Diffusion and Migration in Ionic Membranes**

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Membranes serve important functions as ion and water diffusion barriers in water purification, energy storage and conversion systems, and food processing applications. We have explored the factors that control the ionic resistance and permselectivity of ion exchange membranes for both sodium chloride and ammonium bicarbonate processes. Our data has quantified the resistance-permselectivity tradeoff for a wide range of membranes and demonstrated that both the water uptake and fixed charge density are important parameters in determining overall membrane performance. Interestingly, when the resistance of an anion or cation exchange membrane is measured between two compartments of different concentration, like in reverse electrodialysis (RED), the resistance is much greater than what is reported by the manufacturers. We will report the underlying phenomena governing ion exchange membrane behavior and show how this fundamental knowledge can be used to understand RED stack resistance.