

# Selective Ion Transport in Membranes with Sub-Nanometer Pores



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(ZOOM link released day of seminar)**

**ABSTRACT:** Synthetic membranes are enabling components in key technologies at the water-energy nexus, including desalination and energy conversion, due to their high water/salt selectivity or ionic conductivity. However, many applications at the water-energy nexus require ion selectivity, or separation of specific ionic species from other similar species. Herein, we first provide an overview of the evolution of membrane research from high water permeability to high water/salt selectivity, and finally to ion-ion selectivity. We highlight how insights from nanofluidics and ion-selective biological channels, establish the basis for a new class of membranes with ion-ion selectivity. A few examples are provided to elucidate the mechanisms of ion transport and selectivity in membranes with sub-nanometer pores. These include the transport of monovalent ions in reverse osmosis membranes, the role of host-guest chemistry in controlling the electivity of divalent metal ions, and the role of anion interactions with the membrane pore matrix in controlling the selective transport of fluoride ions. We conclude with a discussion on research directions and critical challenges for developing ion-selective membranes