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Nanomaterials for Energy Applications

Two of the major targets in energy sector are maximizing the use of renewable energy sources and minimizing carbon footprints. To achieve these goals, development and fundamental understanding of materials at nanoscale for renewable energy applications are highly needed. Ion containing polymer (Ionomer) based nanomaterials are of huge importance in developing separators and electrodes for many applications (e.g. fuel cells, Lithium ion batteries, Flow Batteries, supercapacitors and many more) which can revolutionize the energy sector. Ionomers show surprising different organization and properties in nanoscale systems as compared to bulk systems due to confinement effects (Figure 1). Although a lot of effort has been given to understand micron scale membranes, the understanding of nanoscale thin films is still not good enough. In this talk, a comparative study of local mobility, water-polymer distribution and transport properties of ionomers in bulk membrane and thin films will be presented. This talk will indicate some of the knowledge gaps in properties of several tens of nm thick ionomer films and potential future research directions which can bridge in those gaps. The nanoscale understanding of polymers will not only benefit the sustainable energy propelled applications, but also will be of high impact to other confined systems seen in ferroelectric, semiconductor and biological applications.

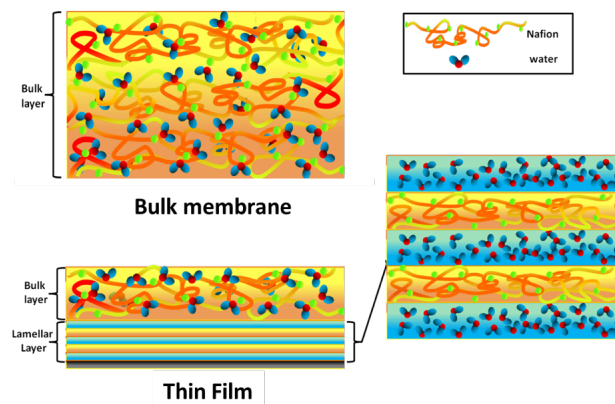


Figure 1. Distribution of a fluorocarbon based ionomers (Nafion) and water molecules in thin film and bulk membrane.

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Wednesday, December 7, 4:30 pm | 136 Jorgensen Hall