Title:

Alignment and Immobilization of Aquaporins on Polybenzimidazole Nanofiltration Membranes

Abstract:

The overarching objective of this project is to form a biomimetic membrane incorporated with functional aquaporins dispersed in a polymeric membrane selective layer and capable of operation under high hydraulic pressure. Polybenzimidazole (PBI) membranes were surface modified with mutated aquaporins in order to improve the rejection of protons, ions and other impurities, aquaporin channels were aligned with the direction of water flow. Functional groups were installed on AqpZ for covalent attachment to the polymer matrix so that the proteins could be immobilized to the membranes and aligned in the direction of the flow. Modified membranes showed lower MWCO as compared to unmodified membranes. Depth profiling using XPS analysis showed the presence of functional groups corresponding to mutated aquaporins in modified membranes. FTIR analysis showed confirmation of an amphiphilic polymer (PVA-alkyl) which was used to seal the gaps in between protein molecules immobilized onto the membrane surface. Membranes modified with mutated aquaporins showed consistently higher salt rejection values irrespective of feed concentration, along with higher flux recoveries and lower flux declines.