Dr. Isabel Escobar, Professor in Chemical and Environmental Engineering at the University of Toledo progressed toward completion of an Ohio Water Resources Center funded project via an OWDA subaward. Her project entitled **"High-performance Biologically Inspired Membranes for Water Treatment"** relies on the idea of combining the ultra-efficient functioning of biological molecules with the productivity of synthetic membranes. These biomimetic membranes with structure and function similar to the membranes of living organisms may offer the ultimate breakthrough for low-energy desalination.

Figure 1 Membrane preparation

The objective of the project is to make a new class of biomimetic nanofiltration membranes by modifying their surface and making them chemically and mechanically stable. In short, aquaporins were treated with polysaccharides to protect them, and then were embedded in amphiphilic PVA-alkyl matrix (Figure 1). This PVA alkyl with embedded aquaporins will be used as the nanofiltration membrane active layer. Two main membranes were developed - Polybenzimidazole (PBI) hydrophobic membranes and modified surface activated 4-chloromethyl benzoic acid (CMBA) that imparted the negative charge on membrane surface and serves as platform for functionalization of the membrane. Virgin PBI and PVA-alkyl modified membranes are currently tested to determine the flux decline during operation and flux decline of virgin and PVA-alkyl modified PBI membrane are shown in Figure 2. Further surface modification and testing of the newly developed biomimetic membranes is underway.

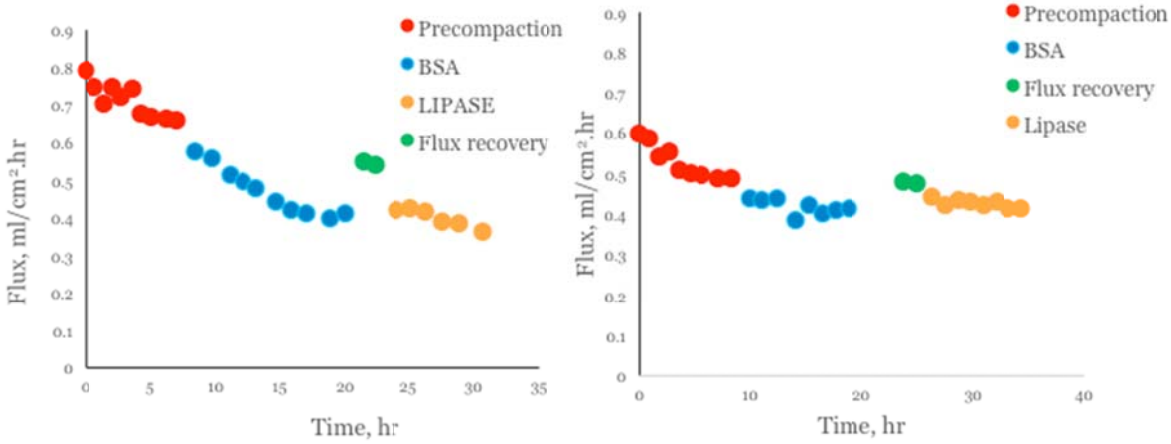

Figure 2 Flux analysis of virgin (left) and PVA-alkyl modified (right) PBI membrane

Researcher: Dr. Escobar's research focuses on developing and/or improving polymeric membrane materials for water/wastewater treatment and water reuse operations through membrane post-synthesis modifications, the use of dynamic membranes, and process modifications.