DWRG
DRINKING WATER RESEARCH GROUP

Working together for innovation in drinking water quality, treatment, and distribution

Optimizing NF and RO Performance in Removing PhACs and EDCs

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Collaborators:
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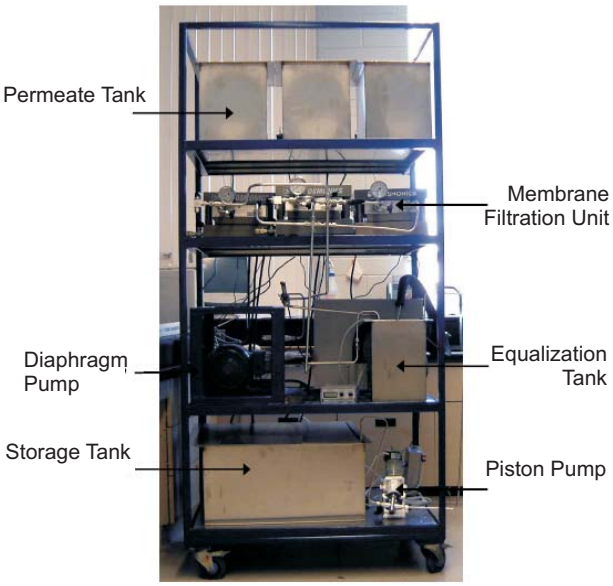

Figure 1: Bench scale membrane filtration system

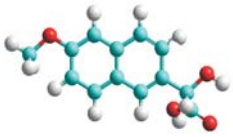

Figure 2: 3-D structure of Naproxen (PhAC)

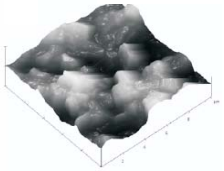

Figure 3: Atomic force microscopy (AFM) image of a membrane used to filter lake water

The occurrence of trace levels of "emerging" micropollutants including pharmaceutically active compounds (PhACs), endocrine disrupting compounds (EDCs), and personal care products (PCPs) in drinking water sources have raised concerns about their potential synergistic effects on human health. When compared to conventional treatment, high pressure membrane filtration technologies, especially nanofiltration (NF) and reverse osmosis (RO) have been demonstrated as promising treatment methods. However, EDC/PhAC removal via membrane applications is complex and influenced by various compounds and membrane properties. As opposed to generally higher removal of larger molecular weight, charged compounds (>80%), the removal of low molecular weight (MW<200 g/mol) undissociated solutes by NF/RO membranes has been observed to be quite variable (less than 50% to above 90%). Moreover, very few studies have focused on the influence of typical components found in surface waters on EDC/PhAC rejection.

Currently, we are investigating the interactions of selected PhACs and EDCs with NOM, colloidal particles, and cations on NF and OR performance. PhAC have been selected from various classes of "emerging" micropollutants, representing a wide range of physicochemical properties. NF/RO membranes have been chosen such that they correspond to a range of properties that may influence rejection. Filtration experiments are being carried out using bench-scale filtration units (Sepa CF II) with flat sheet specimens of NF/RO membranes in place. Unlike the typical membrane filtration setups used in rejection experiments, our experimental setup is representative of full-scale membrane systems, where high permeate recoveries (30 – 90%) are attained.

Results of this study will assist in the design and selection of appropriate pretreatment strategies and ultimately the optimal (enhanced) removal of PhAC/EDCs when using NF orRO membranes.

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