Novel Fabrication for Graphene Oxide/Polymer-based Thin Film Composite Membranes with Enhanced Filtration and Antifouling Characteristics

Brendan Evans, Sanju Gupta, and Naomi Rowland

Department of Physics, Western Kentucky University, Bowling Green, KY 42101

Abstract

Water is our planet's most precious resources and life's most basic indispensable component. Reverse osmosis (RO) filtration is highly adopted, growing technologies to produce clean water by removing undesired (charged or uncharged) solute species. However, polymer and ceramic membranes suffer from low permeability, structural breakdown and fouling. Graphene, a form of carbon, provides the foundation for the production of highly permeable membranes as an emerging technology for RO desalination. Adding oxygen to few-layer graphene nanosheets, *i.e.* graphene oxide (GO), opens allows efficient adsorption of charged ionic species (selectivity) and augmented flow of water molecules (ultrafast permeability). This works reports on the development of novel graphene oxide thin film nanocomposite (G-TFNC) membranes embedded with a thinner active polymer layer via interfacial polymerization to tackle the trade-offs among water flux transport and salt ionic species rejection, robustness and anti-fouling characteristics. This study overcomes the gap between drinkable freshwater demand and supply through nanotechnology-enabled high performance graphene composite membranes.