Introduction

Membrane separation is energy-efficient and easy to operate. Dye desalination using membranes is of great interest in textile industry. In this study, reduced graphene oxide (rGO) membranes are used to separate dye/salt mixtures. The rGO membranes have nanochannels with a size lying between those of the salt ions and the dye molecules. The rejection values of the membranes are examined under different operating conditions.

Methods and Materials

A thin film composite (TFC) membrane of an rGO selective layer and a polymeric support layer is constructed. A dead-end cell filtration experiment is conducted to collect data for rejection analysis.

Constructing rGO membrane
- Pre-treat a commercial polymeric membrane.
- Prepare an rGO dispersion.
- Filtrate the dispersion through the polymeric membrane via vacuum assistance.

Dead-end Cell Nanofiltration Test
- Fix the rGO membrane at the bottom of the cell.
- Load the solution into the cell.
- Apply pressure to facilitate the filtration and collect the permeate.
- Apply different methods to determine the components of interest in the permeate and the retentate.

Results and Discussion

Figure 3 shows the light absorption spectrum curves of the permeates and the retentates of different dyes and the calculated rejection.

Rejection Calculation:
Rejection = 1 - Indicator Value / Dilute Multiple of Permeate
The measurable indicator value is proportional to the concentration of the component of interest and is respectively:
- Electrical conductivity, for salt ions.
- Ultraviolet and visible light absorption, for dye molecules.

Conclusion

The rGO membrane shows promising properties and great potential for dye desalination process, for the following various reasons:
- **High rejection for dye molecules and low rejection for salt ions:** these show its exceptional promise for dye/salt separation application.
- **Rejection for salt ions decreases with the increase of salt concentration:** the separation outcome becomes even better at high salt concentration, implying the good potential of rGO membranes for industrial application.
- **Good pure water permeance:** this property indicates that the membrane can potentially process the dye/salt wastewater at a fast rate with good energy efficiency.
- **Good anti-fouling property:** this membrane allows very little dye-fouling to happen, which helps keep the flux at a high level after repeated use.

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References


Any questions regarding this poster are welcomed!
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