Nanocomposite Ion Exchange Membranes Based on Modified Graphene Oxide for Desalination

Adetunji Alabi [a,b], Linda Zou [a,b]
[a] *Department of Civil and Environmental Engineering, Khalifa University, PO Box 127788, Abu Dhabi, United Arab Emirates*
[b] *The Research & Innovation Center for Graphene and 2D Materials (RIC-2D), Khalifa University, PO Box 127788, Abu Dhabi, United Arab Emirates*
adetunji.alabi@ku.ac.ae; linda.zou@ku.ac.ae

There have been considerable research efforts to produce ion exchange membranes (IEMs) with desirable properties for electromembrane processes such as electrodialysis desalination. IEMs have received considerable interest owing to their critical role in electromembrane processes [1]. An approach gaining much attention is via the incorporation of graphene-based nanomaterials in the polymeric matrix of IEMs to create nanocomposite IEMs [2]. This is due to the electrical conductivity, mechanical strength and specific surface area of graphene [3]. We present a strategy that successfully uses graphene-based nanosheets as the only source of electrochemical properties in nanocomposite IEMs. Here, modified graphene-based nanomaterials were incorporated into an uncharged polymeric matrix to create nanocomposite IEMs for electrodialysis desalination. A newly developed mold-casting technique was used to fabricate the nanocomposite IEMs with high content of modified graphene-based nanomaterials as the source of ion exchange capabilities. The fabricated nanocomposite IEMs demonstrated favorable properties and performances including comparable current efficiency and salt removal during electrodialysis experiments.

References

[1] H. Strathmann, A. Grabowski and G. Eigenberger, *Desalination*, 2006, **199**, 1-3.
[2] A. Alabi, A. AlHajaj, L. Cseri, G. Szekely, P. Budd and L. Zou, *npj Clean Water*, 2018, **1**, 10.
[3] A. K. Geim and K. S. Novoselov, Nat. Mater., 2007, 6, 183-191.

Figures

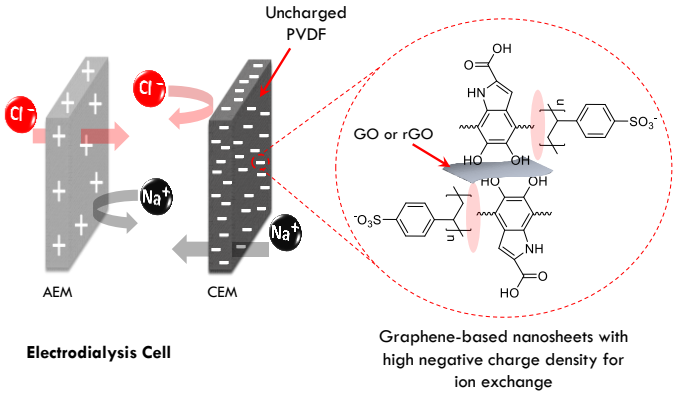

Figure 1: Electrodialysis cell and components of the fabricated nanocomposite IEMs.

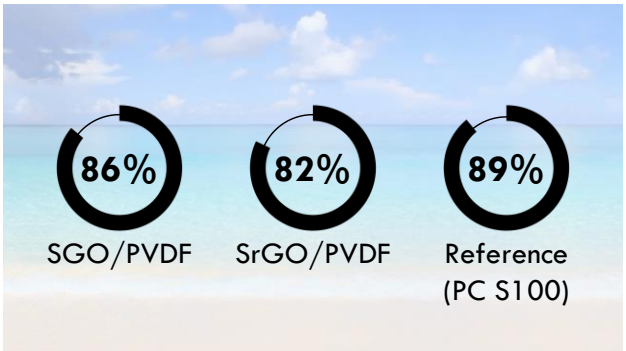

Figure 2: Salt removal of the fabricated nanocomposite IEMs and reference IEM during the electrodialysis test