Graphene-oxide based membrane as scalable ion-selective material with tunable permselectivity

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Reverse electrodialysis (RED) is the salinity gradient energy harvesting from the difference in the salt concentration between seawater and river water based on the exploitation of ion exchange membranes (IEM). 2D materials have been studied as an alternative to traditional polymeric IEM due to their great transport properties, good ionic conductivity, impressive mechanical strength, and antifouling characteristics [1]. Graphene oxide (GO) membranes have been proposed in this study to be used as cation-exchange membranes as they are naturally negatively charged thanks to their oxidized functional groups, have good mechanical strength, low cost, and facile synthesis.

In literature, small area GO membranes produced by non-scalable methods have been reported [2]. One of the novelties of this work is the use of doctor blade technique as a scalable method. Our membranes showed great stability in harsh conditions and even in organic solvents. In this work, GO membranes have been studied and optimized in order to increase permselectivity and reduce ionic resistance. These membranes showed great monovalent cation selectivity even greater than the state-of-the-art polymeric membranes. Results show a direct dependence on thickness with permselectivity and ionic resistance while the lateral size of GO flakes played the opposite role.

References

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