Electrospun nanomembranes at the liquid–liquid and solid–liquid interface - A review

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ABSTRACT

A membrane is a thin layer or sheet at the interface of two material compartments aimed for separation and purification processes. Membranes made using nanofibers, termed as nanomembranes, are preferred at these interfaces to improve the materials and process efficiency because the extreme small size not only lowers the materials requirements but also controls the pore size and distribution. Among the nanofabrication techniques, electrospinning is an industrially viable method of preparing nanomembranes due to its tunable properties as well as affordability. Herein, techniques to modify electrospun nanomembranes (ENMs) for process improvement, such as post-heat treatment, coating, additives, interfacial polymerization, surface chemistry control, pore size and porosity control, hydrophobicity/ hydrophilicity, and flux rejection efficiency at liquid–liquid and solid–liquid interfaces are reviewed. The ENMs in desalination of seawater, textile wastewater remediation, agriculture, biomedical, renewable energy, electrical, and food industries have also been investigated. We also review ENM's potential in liquid gating, which has been cited as one of the top ten emerging technologies. This review also finds areas requiring innovation on ENMs and on the sustainability of the electrospinning technology. Thus, this review provides a one-stop center for various membrane applications at liquid–liquid and solid–liquid interfaces and areas requiring further innovation.

KEYWORDS

Electrospinning; Liquid interface; Nanofibrous membrane; Surface modification; Sustainability and circularity

ACKNOWLEDGEMENTS

RJ Acknowledges the Research & Innovation Department of Universiti Malaysia Pahang for the research grant RDU203301. The authors also acknowledge anonymous reviewers contributed significantly to improving the quality of this work