

Poly (ethylene furanoate)/Graphene oxide Nanofibrous composite membrane: A Novel Sustainable Membrane for Microplastics Separation

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Microplastic (MPs) pollution poses a global environmental threat, and remediation using sustainable polymer membranes has emerged as a promising approach [1]. Electrospun nanofibrous membranes (ENMs), with their high porosity and tunable properties, are strong candidates for MPs filtration [2]. Poly(ethylene furanoate) (PEF) is a bio-based polymer that can potentially replace petroleum-derived poly(ethylene terephthalate) (PET) in various applications [3]. This work presents the fabrication of novel composite ENMs using a next-generation polymer, PEF, and a functional nanomaterial, graphene oxide (GO), to address microplastics contamination. The optimized PEF/GO composite membrane reached a 0° contact angle within 3 seconds, confirming its superhydrophilicity. Moreover, it exhibited superior chemical, mechanical, thermal, and permeation performance compared to the pristine PEF electrospun membrane, along with a self-assembled multilayered structure. The composite membrane showed improved water flux and achieved efficient separation of polylactic acid (PLA) MPs by forming a removable cake layer. The PEF/GO composite membrane consistently maintained 99.9% PLA MP removal over five filtration cycles. This study highlights the potential of the sustainable PEF/GO electrospun nanofibrous composite membrane for effective and reusable microplastic filtration.

References

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- [2] K. Jurajj, P. Sagitha, A. Sujith, C. Chinglenthoba, Journal of Environmental Chemical Engineering, 13(3) (2025) 116262.
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Figures

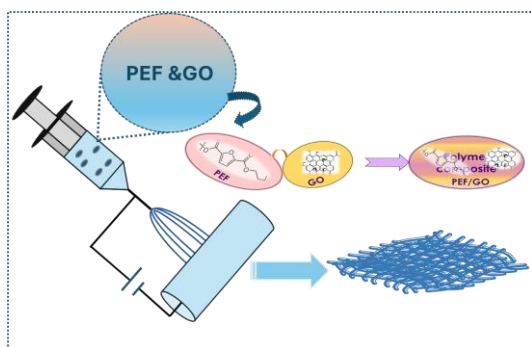


Figure 1: Schematic diagram of the electrospinning process for the fabrication of the PEF/GO nanofibrous membrane

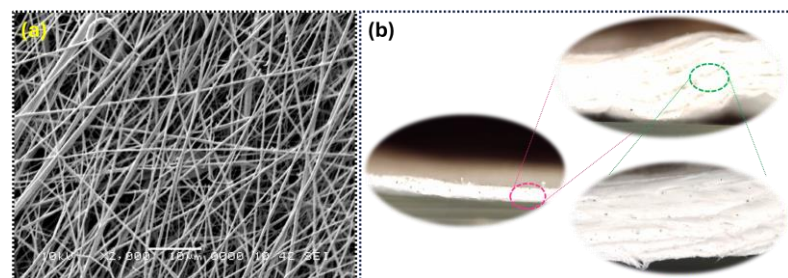


Figure 2: (a) SEM image of PEF/GO nanofibrous membrane (b) Optical images of the multilayered cross-section