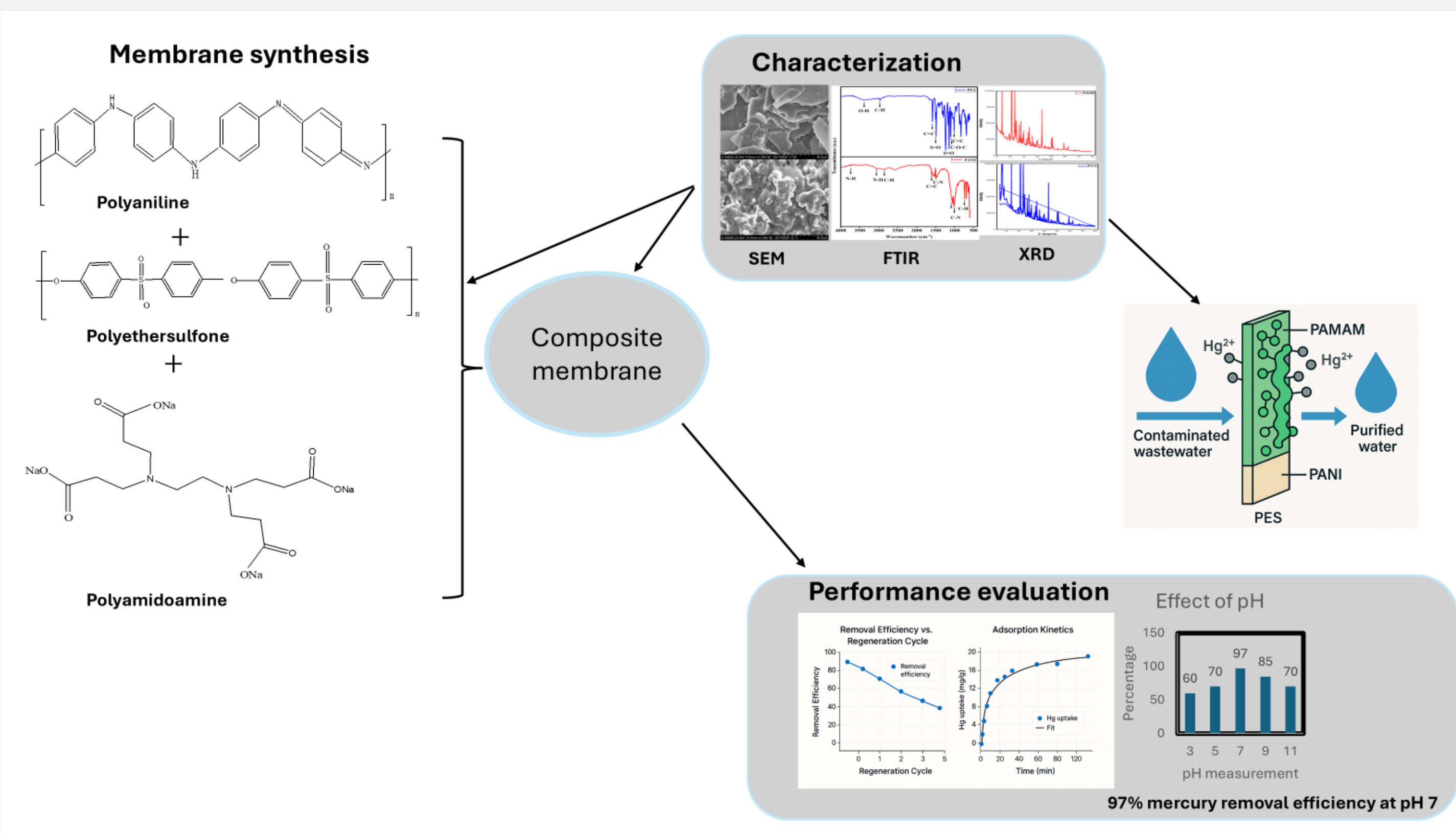


Synthesis and Characterization of Conductive Polymer Nanocomposites for Efficient Mercury Removal from Wastewater

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Graphical Abstract



Introduction

Mercury pollution in wastewater is a big problem for both people and the environment because it is poisonous, lasts a long time, and comes from many different places in industry [1]. Traditional methods of treatment often don't work well to get rid of mercury, which led to the creation of new technologies like conductive polymer nanocomposites. This study presents an innovative composite membrane that integrates PAMAM dendrimers, polyaniline (PANI), and polyethersulfone (PES), with each component providing critical attributes for mercury capture, electrical conductivity, and structural integrity. By taking advantage of the synergistic interactions between these polymers and carefully characterizing them, the membrane achieves an outstanding mercury removal efficiency. This supports the Commonwealth Chemistry mission and the United Nations Sustainable Development Goals by providing a new, scalable way to protect public health and water quality [2].

Experimental

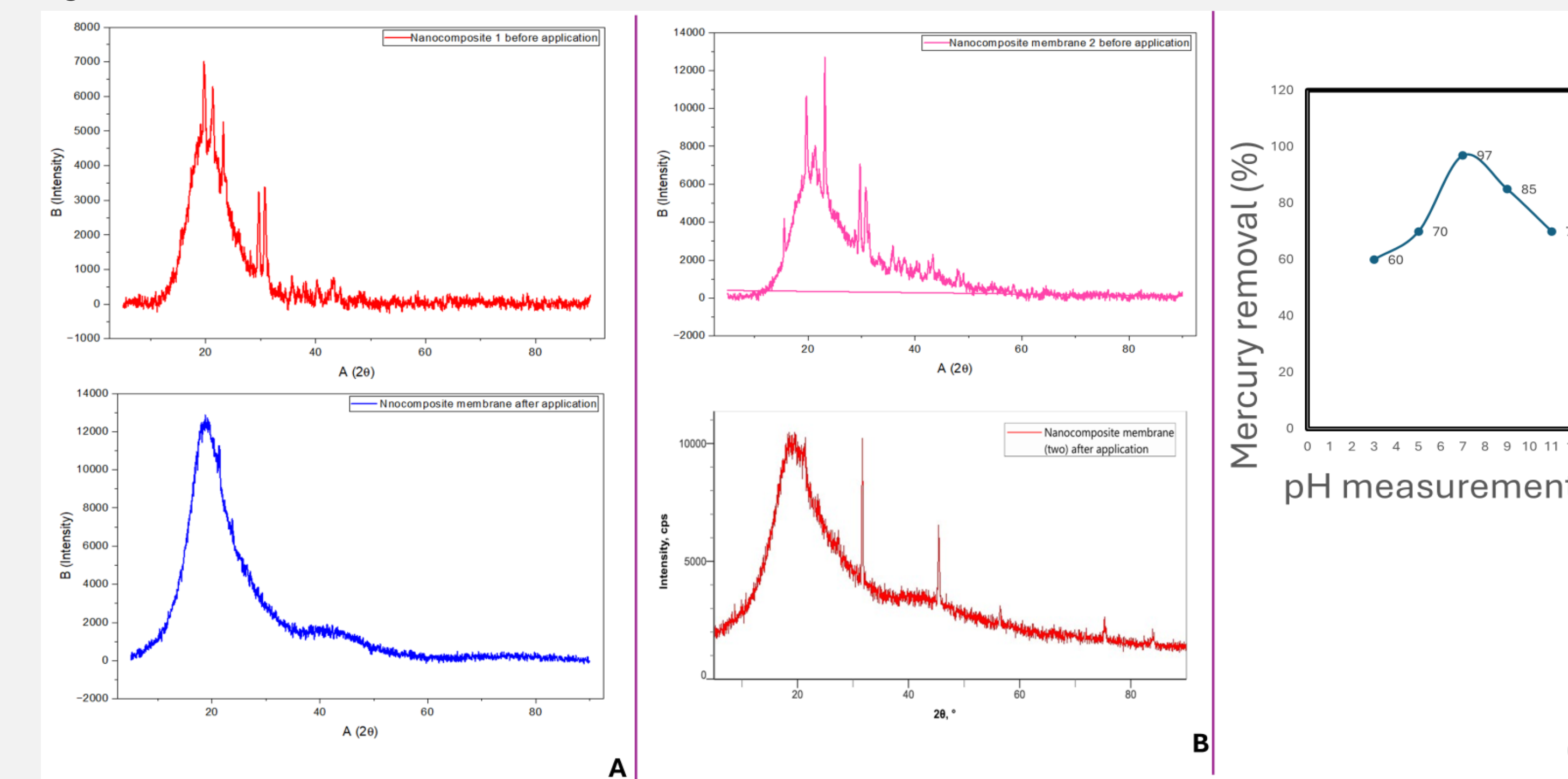
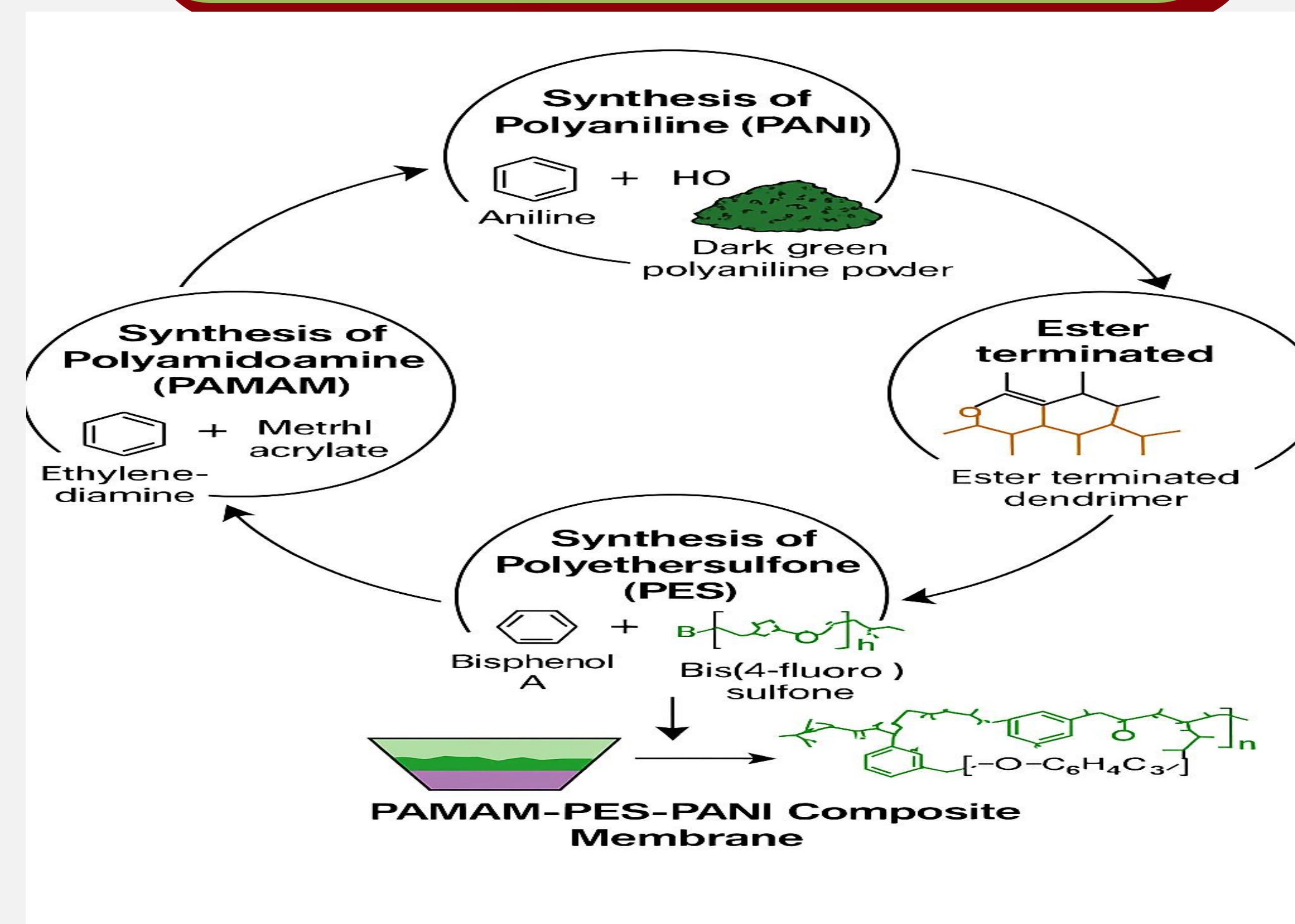


Fig 2. A.XRD analysis of Nanocomposite membrane 1 before and after application, B. XRD analysis of the Nanocomposite membrane 2 before and after application, C. Mercury removal efficiency in 5 pH measurements

Conclusions

- Conductive polymers (PANI,PES) were synthesized successfully.
- PAMAM did not develop during solidification, this morphological failure compromised structural and elemental analysis, XRD showed no distinct phase features attributed to the gel and SEM-EDX images and spectra were low quality and inconclusive.
- These conductive polymers were integrated to form a composite membrane.
- The composite membrane showed excellent and efficient mercury removal.

References

- [1].Li, H., Pan, C., Peng, X., Zhang, B., Song, S., Xu, Z., Qiu, X., Liu, Y., Wang, J., & Guo, Y. (2025) <https://doi.org/10.1038/s41467-025-57197-8>
- [2]. Mills, R., Baldrige, K. C., Bernard, M., & Bhattacharyya, D. (2023). <https://doi.org/10.1080/01496395.2022.2145222>

Acknowledgements

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Results: Characterization and application

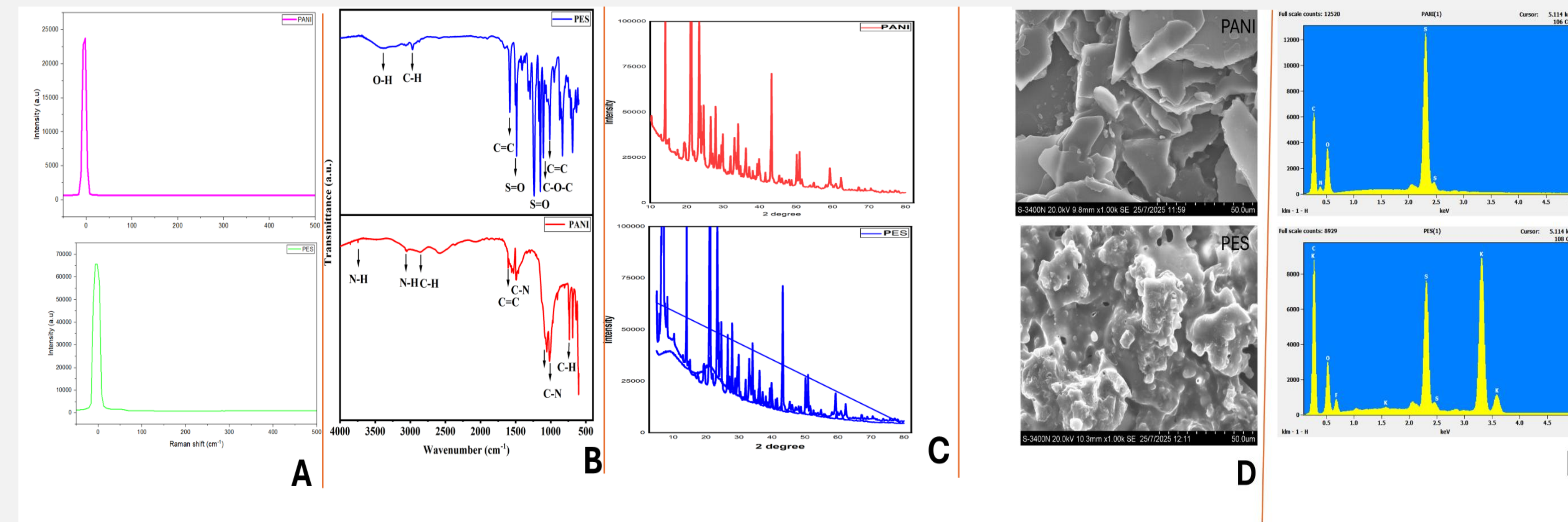


Fig 1. A. Raman, B. FTIR, C. XRD, D. SEM, E. EDX of the individual conductive polymers