

Enhancing hydrophilicity and antifouling propensity of PES-based membranes using Fe-BTCA MOF and Fe-BTCA@GO

R. Phadagi*, Meladi L. Motloutsi, Funeka Matebese, NN Gumbi-Madzivha, RM. Moutloali*.

Institute for Nanotechnology and Water Sustainability, College of Science, Engineering, and Technology, University of South Africa, Florida Science Campus, 1710, South Africa

*e-mail address: 14778386@mylife.unisa.ac.za; moutlrm@unisa.ac.za



Introduction

UF membranes are increasingly becoming the membranes of choice in water treatment as they require relatively low pressure, and they are good enough to treat water that is not highly contaminated [1]. Nonetheless, they suffer from excessive fouling, causing loss of flux overtime, thereby increasing the overall maintenance and operational costs [2]. To mitigate this issue membranes can be blended with nanoparticles such as MOFs and the resultant membrane will have improved water flux and better anti-fouling properties, since most MOFs don't meet practical requirements due to poor hydrothermal stability, they can be complemented with GO and will lead to membranes with substantial properties [3].

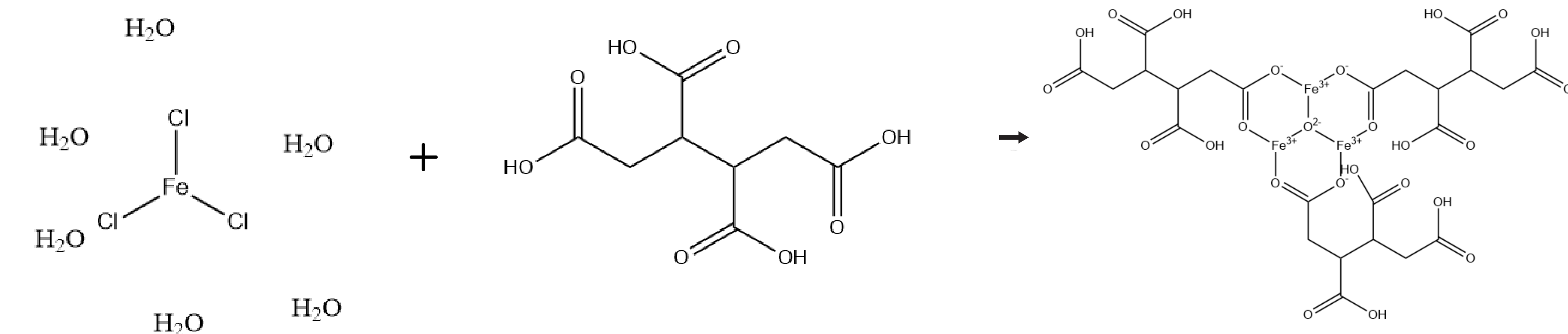
Objectives

1. Synthesis Fe-carboxylate MOF and its composite with GO
2. Fabricate mixed matrix membranes
3. Evaluate the properties of the MMMs
4. Test fabricated MMM in treatment of abattoir wastewater

Researched SDGs

- SDG 6 – Clean water and sanitation
SDG 9 – Industry, innovation and infrastructure

Fe-1,2,3,4-tetrabutane carboxylate synthesis / (Fe-BTCA/Fe-BTCA@GO)



Fe-MOF/ Fe-MOF@GO Results

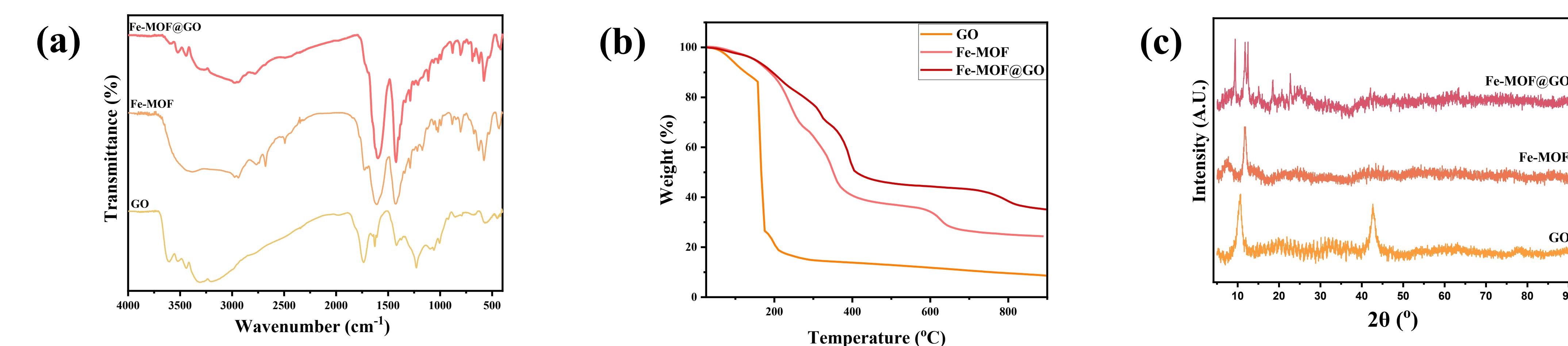


Fig. 1 • (a) FTIR spectra, (b) thermal stability, and (c) XRD of GO, Fe-MOF, and Fe-MOF@GO nanofillers.

Membrane fabrication and application

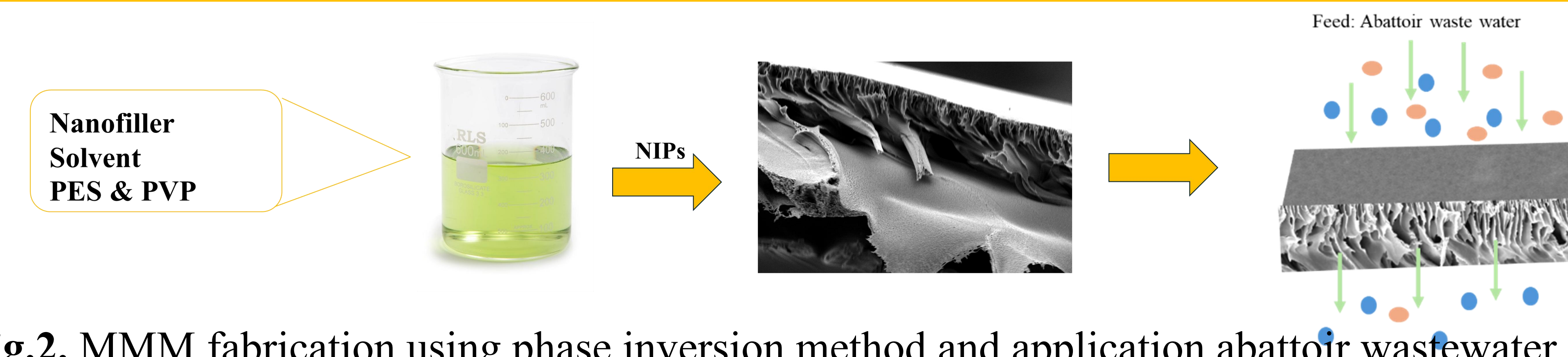


Fig.2. MMM fabrication using phase inversion method and application abattoir wastewater

Results

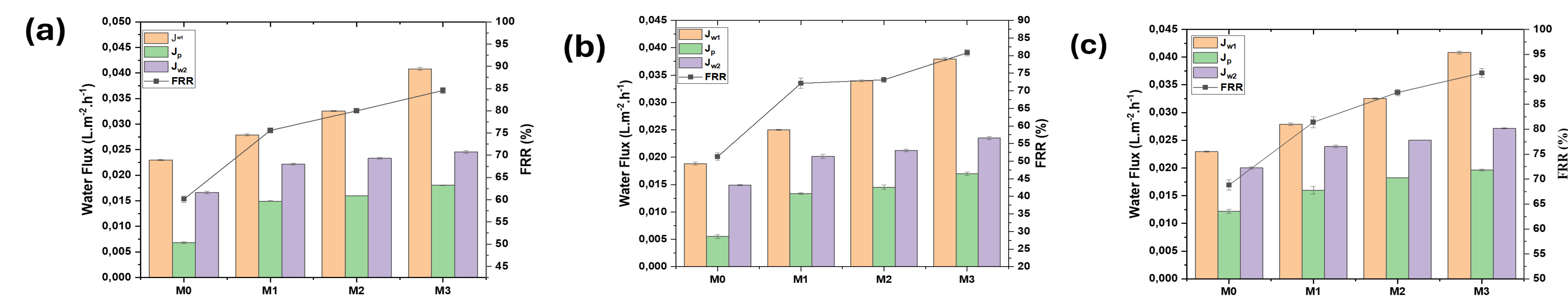


Fig.3. Permeability of (a) BSA, (b) Raw abattoir and (c) Pretreated abattoir wastewater.

Conclusion

PES membranes had the lowest flux, lowest flux recovery ratio (FRR) due to its inherit hydrophobic nature and MMMs had improved properties due to the incorporation of oxygenated functional groups and the treated effluent met RSA regulatory for non-potable water reuse standards.

Acknowledgements



References

- [1] Dizman, C., et.al. Polymer international, 62 (2013) 991-1007.
- [2] Mahmoudi, E., et.al. Scientific Reports, 9 (2019) 1216.
- [3] Ma, J., et.al. Chemical Engineering Journal, 313 (2017) 890-898.