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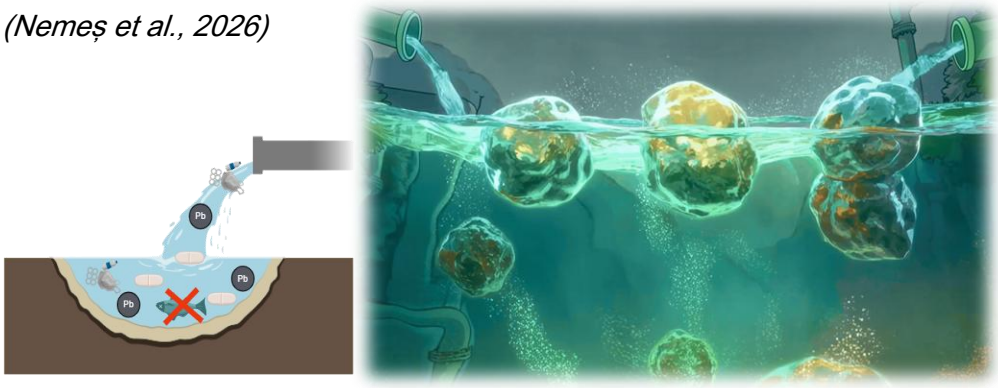
Green Composite PLA-based Electrospun Membranes containing Biochar from Peanut Shells to capture Hexavalent Chromium into water

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Introduction

"In the context of a global water crisis, heavy metal pollution has become a severe and often uncontrollable problem due to relentless industrial growth and population explosion."

(Nemeș et al., 2026)



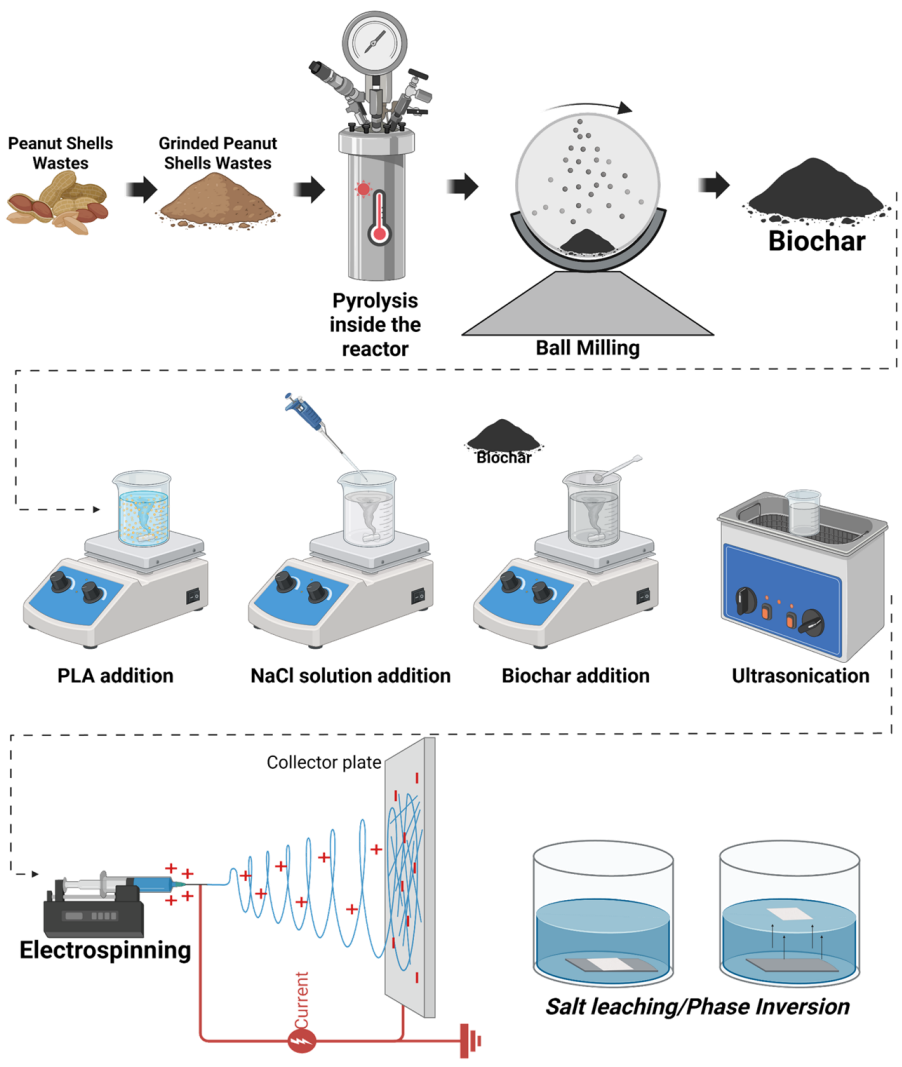
- Filtration using membranes
  - Adsorption
    - High Performance
    - Removal in low concentrations
    - Low Cost
  - Adjustable Properties
  - Continuous Separation
  - Possibility of scaling



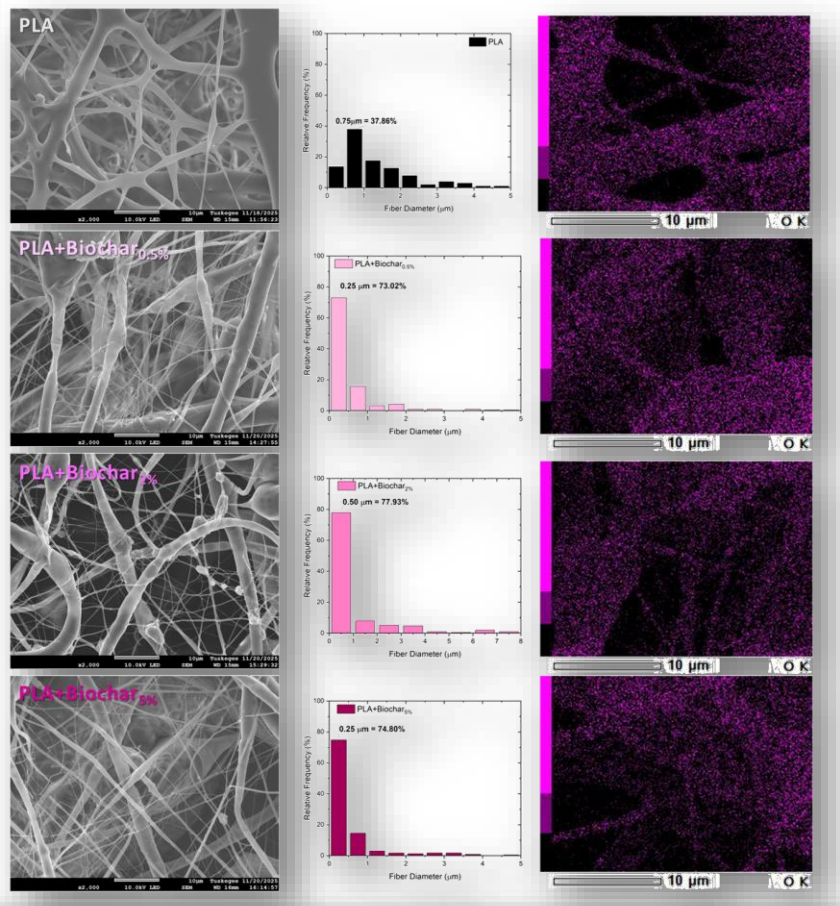
Objectives

We developed electrospun fiber membranes from Poly(lactic acid) (PLA) containing biochar derived from peanut shell waste at different biochar contents (0.5, 2, and 5 wt.%) for hexavalent chromium (Cr^{6+}) ion removal in simulated water.

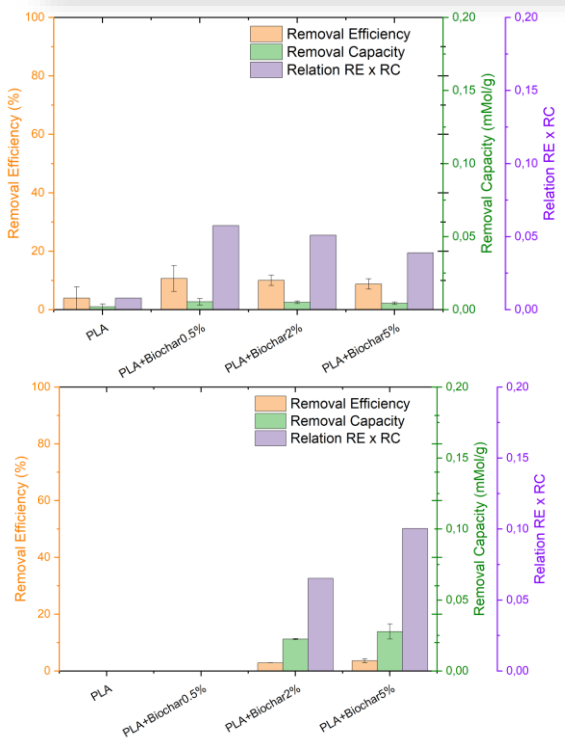
Methodology



Results and Discussion



Samples	C (%)	O (%)	N (%)	Elastic Modulus (MPa)	Maximum Tensile Strength (MPa)	Elongation at break (%)
PLA	86.65 ± 2.53	12.11 ± 2.75	0.80 ± 0.19	5.98 ± 2.54	0.19 ± 0.06	3.23 ± 0.93
PLA+Biochar$_{0.5\%}$	82.88 ± 4.24	9.72 ± 2.01	4.72 ± 0.42	16.00 ± 7.50	0.27 ± 0.07	1.32 ± 0.07
PLA+Biochar$_{2\%}$	84.57 ± 2.63	10.19 ± 2.45	4.48 ± 0.43	7.41 ± 1.46	0.25 ± 0.05	3.39 ± 0.73
PLA+Biochar$_{5\%}$	80.81 ± 1.49	12.63 ± 0.01	6.11 ± 1.55	18.42 ± 1.60	0.36 ± 0.04	2.67 ± 0.55

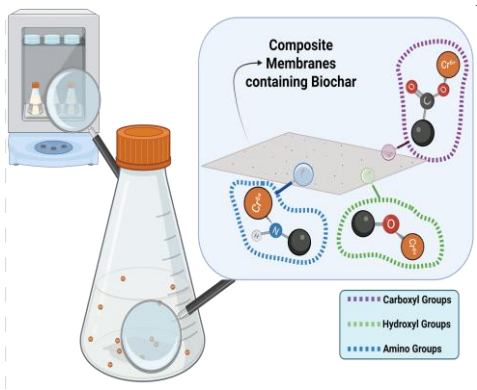


A slight reduction in removal efficiency and capacity at C0 = 0.05 mMol/L could be attributed to heterogeneity and possibly to aggregates of biochar particles on the membrane's surface, thereby limiting the active sites available to capture hexavalent chromium.
(SHAKIL et al., 2025)

Increasing the biochar percentage provided more biochar and its active sites, such as hydroxyl, carboxyl, and amino functional groups on the membrane's structure, thereby successfully removing.
(GONÇALVES et al., 2025)

Conclusions

- PLA/biochar membranes exhibited good efficiency in Cr^{6+} removal.
- Biochar addition reduced fiber diameter.
- Biochar concentrations of 0.5 and 5% improved mechanical properties.
- The presence of oxygen- and nitrogen-containing groups enhanced adsorption.
- Cr^{6+} removal was more efficient under acidic conditions.
- Biochar improved the adsorption capacity of the membranes.
- The membranes demonstrated potential for the sustainable treatment of contaminated water.



References

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