FAKULTA MECHATRONIKY, INFORMATIKY A MEZIOBOROVÝCH STUDIÍ TUL

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ADVANCED SKIN LAYER MODIFICATION OF SUBMERGED POLYETHER SULFONE HOLLOW FIBER MEMBRANE FOR USING IN MBR

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ABSTRACT

- Skin layer modification of the PES HF membrane was conducted using two methods: a) polydopamine, and b) polydopamine + zinc oxide nanoparticles.
- Optimal and critical characteristics evaluation of polyether sulfone (PES) hollow fiber (HF) membrane used in a bioreactor system for wastewater treatment were investigated.
- Fouling rate and critical flux of the surface-modified membranes were tested with water and activated sludge collected from the real wastewater treatment plant.

INTRODUCTION

- The industry's growing energy and water supply needs have driven the development of advanced wastewater technologies.
- Submerged hollow fiber membranes integrated into bioreactors combine biological treatment with membrane filtration (MBRs) are favored for their capacity to recycle wastewater [1-2].
- However, The accumulation of foulants and organic pollutants on the membrane surface results in pore blockage and reduced membrane efficiency [2-3].
- Skin layer modification of HF membranes to reduce the need for frequent backwashing, chemical cleaning, and transmembrane pressure (TMP) [3].

METHODOLOGY

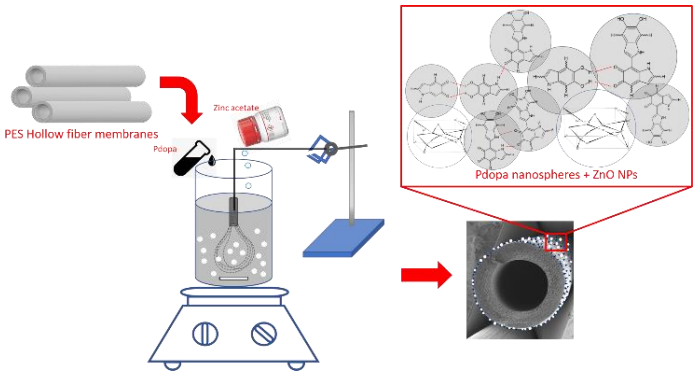
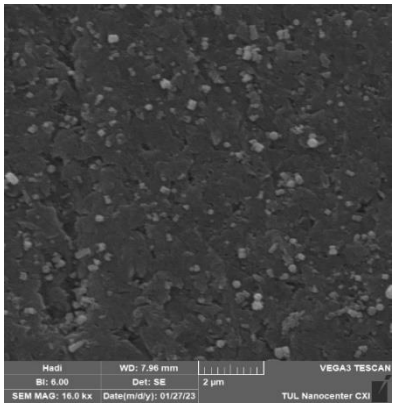


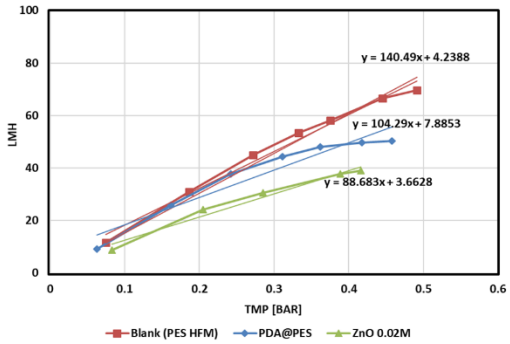
Figure 1: Membrane module preparation and modification.

RESULTS AND DISCUSSION

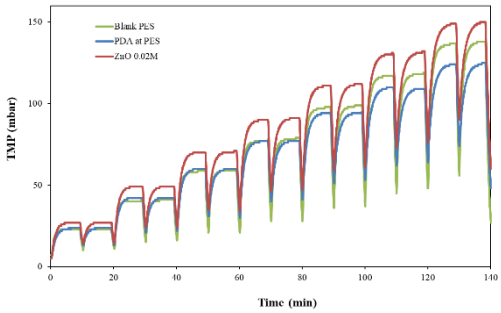


SEM analyses demonstrated promissing immobilization process of ZnO NPs on the skin of PES HF membranes.

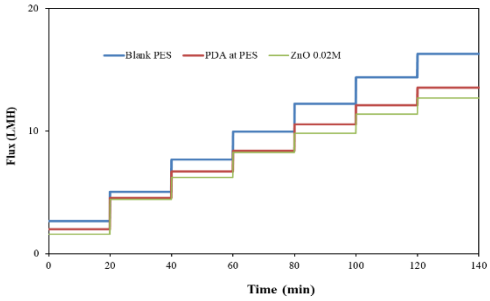
Figure 2. SEM image of the surface modified PES HF membrane.



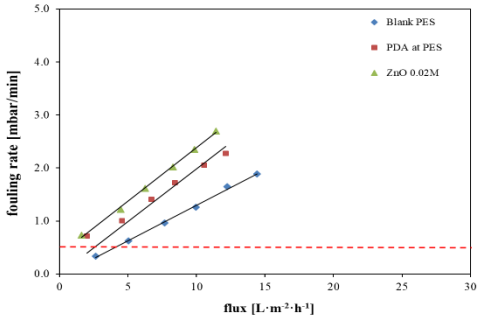
Permeability results of: blank, PDA treated, and ZnO contain modified samples.



Results of the sludge filtration experiment, including diagrams of the fouling rate and critical flux.samples.



Results of the flux change during sludge filtration experiment.



Despite the reduction in permeability and increased critical flux, it is reasonable to assume the reduction in biofilm formation and improved system performance.

REFERENCE

[1] Roziana Kamaludin et. al., Polyvinylidene difluoride (PVDF) hollow fiber membrane incorporated with antibacterial and anti-fouling by ZnO for water and wastewater treatment, 2022. Membranes, 12(2).

[2] Hoseok Jang et. al., Response surface methodology to investigate the effects of operational parameters on membrane fouling and organic matter rejection in hard-shell encased hollow-fiber membrane, 2022. Chemosphere, vol 287, 132132.

[3] W. Liu, H. Lin, J. Wang, Q. Han and F. Liu. Polytetrafluoroethylene (PTFE) hollow fibers modified by hydrophilic crosslinking network (HCN) for robust resistance to fouling and harsh chemical cleaning, 2021. Journal of Membrane Science 630, 119301.

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