

Catechol-based coatings and incorporation of AgNPs into nanofibrous and commercial membranes structure for antibacterial properties in water filtration

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Abstract

Nowadays it is very important to recycle and reuse raw materials. This allows for sustainable development, proper waste management and reduction of production costs. As the population grows and industry expands, the demand for water increases [1]. It is important to find a quick and efficient way to regenerate water. One of these ways is membrane filtration. However, the limiting factors for the speed and efficiency of filtration are the decrease of water flow over time, fouling and the growth of microorganisms on the membrane used [2]. To overcome these problems, a membrane with anti-fouling and antibacterial properties has to be designed. Our membranes were coated based on the reaction of catechol with hexamethylenediamine or (2-aminoethyl) amine. The reactions were optimized so that a coating rather than a thin film was formed on the membrane surface. For antibacterial properties, silver nanoparticles were attached after the coating reaction. The visual changes on the surface were observed, the size of the attached AgNPs was measured, changes in the water flux were checked, and antibacterial tests against *Escherichia coli* were performed.

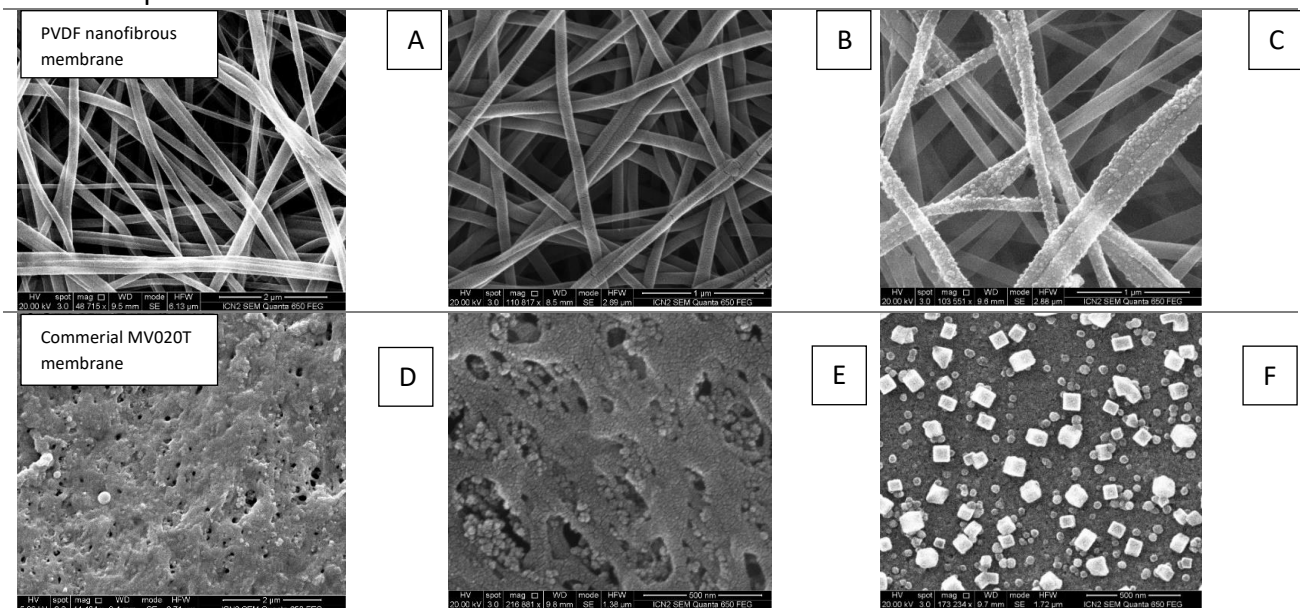


Figure 1: PVDF nanofibrous membrane and commercial available membrane Nadir MV020T A,D - pristine, B,E – CAT-TRIS coated, C,F – with Ag nanoparticles.

References

- [1] Peydayesh, M. and Mezzenga, R., 2021. Protein nanofibrils for next generation sustainable water purification, *Nature communications*, 12 (2021), 12(1), page 1-17
- [2] Gončuková, Z., Řezanka, M., Dolina, J. and Dvořák, L., Sulfonated polyethersulfone membrane doped with ZnO-APTES nanoparticles with antimicrobial properties, *Reactive and Functional Polymers*, 162 (2021) page 104872