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Fish scale biomembrane with surface modified by PSU and ZIF-8 for effluent treatment

José Yago Rodrigues Silva[1], Júlia Fernanda da Costa Araújo[1], Brenda Violane Andrade Tavares de Melo[1], Severino Alves Júnior[1]

[1]Department of Fundamental Chemistry, Federal University of Pernambuco, Recife, Brazil

E-mail: jyagors@gmail.com

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The contamination of water bodies by effluents rich in dyes has been growing increasingly, representing a significant environmental challenge. The effective removal of these contaminants is essential for the protection of ecosystems and for the provision of clean and safe water to all, as preached in SDG 6.[1] Seeking to solve this demand, the development of a biomembrane (BM) for effluent treatment made from collagen from the scales of the Amazonian fish *Geophagus brasiliensis*, popularly known as Acará, will be reported. Its surface was modified with ZIF-8, a highly porous and selective material, and the polysulfone polymer (PSU) provided stability and resistance to BM. To extract collagen from Acará scales, they were placed in an acetic acid solution and the microwave then washed in water and dried. The synthesis for the impregnation of ZIF-8 was adapted from Cravillon *et al*.[2]. In the methanol and zinc nitrate solution, the membrane is placed under stirring, and the solution with 2-MeIM is added. Characterizations were carried out by FTIR, BET, and SEM (Figure 1). Then, the PSU is solubilized in DMF, and the membrane with ZIF-8 impregnated is fixed and left to dry in an oven. To be subjected to adsorption processes with the trypan blue dye, the membranes were puted under agitation in solutions containing water with the dye to be adsorbed for 120 minutes. In the FTIR technique, it can be observed that there were no significant changes in functions with the demineralization of the scale nor with the addition of ZIF-8 to the structure. Using the BET method an increase in the surface area was observed when demineralized, and with the ZIF-8 coating, there was a small decrease in the surface area that was already expected and in the volume of the pores, giving more specificity. In SEM, the presence of ZIF-8 nanocrystals can be observed in the membrane pores. Initial trypan blue adsorption tests show promising results through spectrophotometry. Therefore, this membrane is a good alternative for removing dyes from effluents.

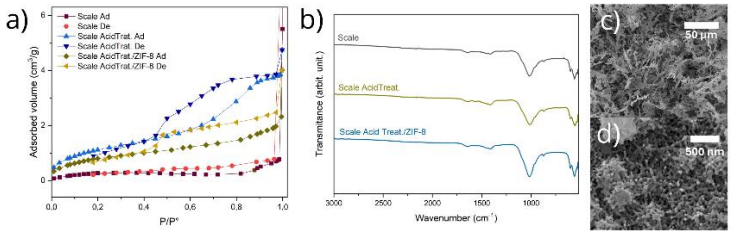

Figure 1. Data from a) BET graph, b) FTIR for the membranes with and ZIF-8 and SEM of the structure removed from the scale c) without and d) with ZIF-8.

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References

[1] D. Soumi *et al.,* Mater. Adv., **2**, 4497-4531 (2021).

[2] J. Cravillon *et al.,* Chem. of Mater., 23(8), 2130–2141 (2011).