31º ENCONTRO DE QUÍMICA DA REGIÃO SUL
A QUÍMICA COMO PROPULSORA DE NOVOS ECOSSISTEMAS DE INOVAÇÃO
19 A 21 DE NOVEMBRO
Campus Toledo
Unioeste

Área: FIS
(Inserir a sigla da seção científica para qual o resumo será submetido. Ex: ORG, BEA, CAT)

Efficiency of Electrospun Membranes in Vegetable Oil Removal: A Sustainable Approach

Felipe Emanuel Cardoso Rosa (IC),[1*] Ana Paula Ghiot (PG) (IC),[1] Douglas Cardoso Dragunski (PQ),[1] Josiane Caetano (PQ)[1].

Feliperosa0411@gmail.com

[1]*Centro de Ciências Exatas e da Terra, UNIOESTE / Toledo, PR.*

Palavras Chave: Ethylcellulose , Ecovio®, Environmental remediation.

Highlights

Electrospun Ecovio® and ethylcellulose membranes showed high efficiency in removing vegetable oil.
Ethylcellulose had greater selectivity and adsorption capacity, being more promising.

Resumo/Abstract

Oil pollution in aquatic environments causes serious harm to human health and ecosystems, exacerbated by the low efficiency of conventional removal methods (Allan, Smith & Anderson, 2012). As an alternative, electrospun membranes have gained attention due to properties such as high porosity, hydrophobicity, and oleophilicity, which favor selective oil/water separation. Electrospun membranes made of Ecovio® and ethylcellulose were evaluated for their ability to adsorb vegetable oil in aqueous media. The Ecovio® membrane was obtained from a 20% w/v polymer solution in chloroform/DMF (85:15 v/v), electrospun at a flow rate of 1.8 mL/h, voltage of 18 kV, and a needle-to-collector distance of 12 cm. The ethylcellulose membrane was prepared from a 10% w/v solution in THF/DMAc (1:4), using the same flow rate, but with a voltage of 15 kV and a distance of 15 cm. Adsorption experiments were conducted in Petri dishes containing 30 mL of water and varying volumes of vegetable oil (0.06 g to 0.3 g). Both membranes showed good affinity with the contaminant, with removal rates above 80% in the initial stage. The Ecovio® membrane achieved 93.3% removal in the first oil addition, while ethylcellulose reached 80.0%. Despite Ecovio®'s higher initial efficiency, its adsorption capacity (2.49 g/g) was lower than that of ethylcellulose (3.26 g/g), suggesting that part of the adsorbed mass may have been water, due to the presence of polar groups in its structure. With increased contact time and oil volume, saturation of active sites and a drop in efficiency were observed: Ecovio® decreased to 37.5% and ethylcellulose to 47.0%. Water absorption by the Ecovio® membrane became more evident at this stage, compromising its oil/water selectivity. In contrast, ethylcellulose maintained greater stability in the presence of water, preserving its selectivity even after prolonged exposure. The results indicate that factors such as contact time, oil volume, water presence, and membrane chemical composition directly influence material performance. Ethylcellulose stands out as a more promising alternative for applications aimed at selective oil/water separation in environmental remediation processes.

ALLAN, S. E.; SMITH, B. W.; ANDERSON, K., Environmental Science & Technology, v. 46, n. 4, p. 2033-2039, 2012.

Agradecimentos/Acknowledgments

To Fundação Araucária for granting the scholarship, to CAPES and CNPq for supporting the research. To Unioeste and GENPEC for the institutional support and infrastructure that enabled the completion of this work.