

Área: ANA

## Hybrid composite membranes based on chitosan for the separation of food dyes in water

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### Highlights

Hybrid composite membranes based on chitosan were synthesized. Zinc oxide and pine waste were employed as filler materials. Innovative composite biomaterials for food dye separation in water.

### Abstract

Chitosan/zinc oxide/pine waste hybrid composite membranes were successfully synthesized and their morphological and structural properties were systematically evaluated. Scanning electron microscopy (SEM) analyses revealed significant changes in the morphology of the membranes, with increased surface roughness and aggregate formation, especially at higher ZnO and pine residue contents. X-ray diffraction (XRD) confirmed the dispersion of ZnO in the biopolymer matrix, while Fourier transform infrared spectroscopy (FTIR) revealed functional groups characteristic of biomass and their interactions in the composite. Based on the determination of the zero-charge point ( $\text{pH}_{\text{PZC}}$ ), it was possible to predict the surface charge behavior of the membranes in different aqueous media. Separation assays of orange yellow S (model food dye) in aqueous solution allowed the evaluation of the effects of the initial dye concentration, as well as the dosages of photocatalyst and pine residue on the structure of the membranes. The maximum separation efficiency reached  $100 \pm 0.05\%$  using the membrane containing ZnO and pine residue, at an initial dye concentration of  $20 \text{ mg L}^{-1}$ , as displayed in the following Figure 1.

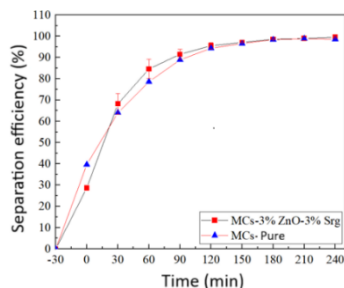


Figure 1. Separation efficiency of orange yellow S from water using chitosan/zinc oxide/pine waste hybrid composite membranes.

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### Reference

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