

عنوان مقاله:

Azo dye removal via surfactant-assisted polyvinylidene fluoride membrane

محل انتشار:

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نویسندگان:

Fatemeh Darbandi - *Department of Chemical Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran*

Azadeh Mousavi - *Department of Chemical Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran*

Tayebe Bagheri Lotfabad - *Department of Industrial and Environmental Biotechnology, National Institute of Genetic Engineering and Biotechnology (NIGEB), Tehran, Iran*

Amir Heydarinasab - *Department of Chemical Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran*

Soheila Yaghmaei - *Department of Chemical and Petroleum Engineering, Sharif University of Technology, Tehran, Iran*

خلاصه مقاله:

Background: Recently, concerns have been raised regarding the environmental and public health safety of azo dyes, the most widely used synthetic dyes. The membrane technique has been introduced as one of the efficient methods for dye removal treatments. Polyvinylidene fluoride (PVDF) membrane manipulated by surfactants was studied for removal of the azo dye, carmoisine. Methods: PVDF membrane was prepared via non-solvent-induced phase separation (NIPS) and used to remove the azo dye, carmoisine. Three nonionic surfactants including Tween 20, Tween 60, and Tween 80 were used individually as additives in casting solutions to improve PVDF membrane properties. Results: Fourier-transform infrared spectroscopy (FTIR) demonstrated the presence of functional groups of carbonyl (C=O) and hydroxyl (OH), assigned to Tween molecules, in the membrane chemical structure. All Tween species caused a decrease in the surface hydrophobicity of PVDF membranes illustrated by the reduced contact angles. Each Tween at a 2% concentration in the dope solution led to an increase in the pore-size of PVDF membranes, which was estimated by scanning electron microscopy (SEM). However, this impact was reversed at Tween concentrations of 4%. Membranes were assessed for dye removal efficiency and permeate flux in a cross-flow system. Permeability of PVDF membranes improved (~78%) with adding Tween 80 at a concentration of 2%. Tween 60 at a 2% concentration resulted in a ~45% increase in dye removal efficiency of PVDF membranes. And, atomic force microscopy (AFM) showed that Tween 60 increased membrane surface roughness. Conclusion: Surfactant-mediated changes in the surface properties of PVDF membrane improved dye removal efficacy.

کلمات کلیدی:

Polyvinylidene fluoride, Coloring agents, Azo compounds, Surface-active agents

