Studi Kinerja Membran Polisulfon (PSf) Komposit dalam Pemisahan Zat Warna

Abstrak

Pemisahan dengan membran PSf diterapkan untuk mengatasi limbah cair industri tekstil berupa pewarna sintesis sisa pencelupan yang sangat stabil sehingga sukar didegradasi. Membran PSf dikenal memiliki ketahanan kimia, pH, termal, dan mekanik yang tinggi. Namun membran PSf memiliki hidrofilisitas rendah dan cenderung menghasilkan struktur simetri sehingga rentan mengalami *fouling. Fouling* yang lebih cepat akan menyebabkan masa hidup membran lebih pendek, menurunkan kinerja membran, dan meningkatkan konsumsi energi. Upaya untuk mengatasi kelemahan tersebut yakni dengan melakukan modifikasi antara PSf dengan suatu material baik melalui *blending* maupun *coating*. Karakterisasi membran PSf komposit dipelajari melalui morfologi membran, analisis gugus fungsi, uji ketahanan termal, uji hidrofilisitas, dan uji kekuatan mekanik. Studi kinerja membran PSf komposit dipelajari melalui permeabilitas dan selektivitasnya. Modifikasi membran PSf dengan berbagai material mampu meningkatkan hidrofilisitas membran hingga 62% dan menghasilkan membran dengan selektivitas terhadap pemisahan zat warna mencapai 99,94%. Membran PSf komposit dengan kinerja yang lebih tinggi mampu berperan besar dalam mengatasi pencemaran lingkungan akibat limbah cair zat warna serta menyelamatkan lingkungan dari krisis air bersih.

Kata Kunci : Hidrofilisitas, Polisulfon, Permeabilitas, Selektivitas, Zat Warna

Study of Composite Polysulfone (PSf) Membrane Performance in Dyestuff Separation

Abstract

Separation with PSf membranes is applied to overcome textile industrial wastewater in the form of synthetic dye residue from dyeing which is very stable so it is difficult to degrade. PSf membranes are known to have high chemical, pH, thermal and mechanical resistance. However, PSf membranes have low hydrophilicity and tend to produce a symmetrical structure so they are prone to fouling. The faster fouling results in shorter membrane life, lower membrane performance, and increases energy consumption. Efforts to overcome these weaknesses are to modify PSf with material either through blending or coating. Composite PSf membrane characterization was studied through morphology, functional group analysis, thermal resistance test, hydrophilicity test, and mechanical strength test. Performance studies of composite PSf membranes were studied through their permeability and selectivity. Modification of PSf membrane with various materials was able to increase hydrophilicity of membrane up to 62% and produce membrane with selectivity to separation of dyes reaching 99,94%. Composite PSf membranes with higher performance can play a major role in overcoming environmental pollution due to dyestuff liquid waste and saving the environmental from a clean water crisis.

Keywords: Hydrophilicity, Polysulfone, Permeability, Selectivity, Dyes