Sintesis Membran Poliviniliden Flourida Dengan Aditif Polietilen Glikol 600 Untuk Pengolahan Air Limbah Berminyak = Preparation of Polyvinylidene Flouride Membran with Polyethylene Glycol 600 Additive for Oily Waste Water Treatment

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Abstrak

Penelitian ini bertujuan untuk mensintesis dan mengevaluasi membran berbasis poliviniliden fluorida (PVDF) dengan penambahan polietilen glikol (PEG) 600 sebagai aditif pembentuk pori untuk aplikasi pengolahan air limbah berminyak. PVDF dipilih karena kestabilan kimia dan ketahanan termalnya yang tinggi, sementara PEG 600 berperan dalam meningkatkan sifat-sifat fisik dan kinerja filtrasi membran. Variasi massa PEG 600 yang digunakan adalah 0,5; 1; dan 1,5 gram. Evaluasi dilakukan terhadap sifat fisik (morfologi, porositas, kekuatan tarik gugus fungsi dan sudut kontak) serta kinerja pemisahan terhadap polutan seperti COD, TDS, TSS, pH, warna dan kekeruhan melalui sistem ultrafiltrasi pada tekanan operasi 3, 4, dan 5 bar. Air limbah berminyak yang digunakan pada ultrafiltrasi akan di pre-treatment terlebih dahulu dengan metode koagulasi-flokulasi dan menggunakan koagulan poliakrilamida. Hasil penelitian menunjukkan bahwa peningkatan massa PEG 600 menghasilkan membran dengan pori-pori lebih banyak, membran lebih tebal, elongasi, porositas dan sudut kontak meningkat, akan tetapi kuat tarik dan modulus young menurun. Namun penambahan PEG 600 dan tekanan operasi pada ultrafiltrasi menurunkan rejeksi terhadap COD, TDS TSS, pH, warna dan kekeruhan. Rentang hasil penyisihan COD, TDS, TSS, dan kekeruhan masing-masing membran secara berurutan yaitu, 45,04–91,59%; 2,78–24,51%; 61,72–91,72%; dan 46,10–89,98%.

.....This study aims to synthesize and evaluate polyvinylidene fluoride (PVDF)-based membranes with the incorporation of polyethylene glycol (PEG) 600 as a pore-forming additive for the treatment of oily wastewater. PVDF was selected due to its high chemical stability and thermal resistance, while PEG 600 contributes to enhancing the membrane's physical properties and filtration performance. The variations in the mass of PEG 600 utilized were 0.5, 1, and 1.5 grams, respectively. The evaluation process encompassed a comprehensive array of physical properties, including morphology, porosity, tensile strength of functional groups, and contact angle. Additionally, the study assessed the separation performance of the ultrafiltration system against various pollutants, such as COD, TDS, TSS, pH, color, and turbidity. The experimental setup utilized operating pressures of 3, 4, and 5 bar. The oily wastewater utilized in ultrafiltration underwent a pretreatment phase that incorporated the coagulation-flocculation method, with polyacrylamide serving as the primary coagulant agent. The findings of the study suggest that increasing the mass of PEG 600 leads to the formation of membranes with a greater number of pores, increased thickness, elevated porosity, and contact angle, while concurrently resulting in diminished tensile strength and Young's modulus. However, the incorporation of PEG 600 and the application of operating pressure during ultrafiltration processes have been shown to enhance the removal of COD, TDS, TSS, pH, color, and turbidity. The range of COD, TDS, TSS, and turbidity removal efficiency for each membrane, respectively, was 45.04–91.59%; 2.78–24.51%; 61.72–91.72%; and 46.10–89.98%.