INTISARI

Asam humat merupakan salah satu komponen *Natural Organic Matter* (NOM) yang banyak ditemukan pada sumber air, senyawa NOM pada dasarnya adalah permeat yang tidak aman untuk dikonsumsi sehingga diperlukan metode pemisahan permeat yang efektif. Membran *polyvinylidene fluoride* (PVDF) banyak digunakan dalam proses pemisahan karena memiliki stabilitas kimia, termal, dan mekanik yang baik, namun sifat hidrofobiknya masih membatasi karakteristik dan kinerja filtrasi. Penelitian ini bertujuan menganalisis pengaruh induksi medan magnet terhadap karakteristik serta kinerja membran PVDF Fe_3O_4 dalam penyisihan asam humat.

Fabrikasi membran menggunakan metode *Non-Solvent Induced Phase Separation* (NIPS) dengan tiga variasi, yaitu membran PVDF murni, membran PVDF/Fe_3O_4 1% tanpa induksi medan magnet, dan membran PVDF/Fe_3O_4 1% dengan induksi medan magnet. Karakterisasi meliputi morfologi, *water contact angle* (WCA), sifat mekanik, serta pengujian *pure water flux* (PWF) dan *rejection* asam humat.

Hasil penelitian menunjukkan bahwa membran PVDF/Fe_3O_4 dengan induksi medan magnet menghasilkan distribusi filler yang lebih homogen dan memberikan karakteristik terbaik dengan porositas sebesar 84,31%, *EWC* sebesar 83,66%, ukuran pori rata-rata 87,23 nm, nilai WCA sebesar 50,28°, serta kekuatan tarik sebesar 1,40 N/mm². Membran ini juga menunjukkan kinerja filtrasi terbaik dengan nilai PWF sebesar 569,23 $L \cdot m^{-2} \cdot j^{-1}$ dan *rejection* asam humat sebesar 77,99%, lebih tinggi dibandingkan membran PVDF murni maupun membran PVDF/Fe_3O_4 tanpa induksi medan magnet. Meskipun peningkatan karakteristik dan kinerja akibat induksi medan magnet relatif moderat, hasil penelitian menunjukkan bahwa penerapan medan magnet mampu mengoptimalkan distribusi nanopartikel Fe_3O_4 di dalam matriks PVDF.

Kata kunci: Membran, PVDF, *filler* Fe_3O_4, induksi magnet, *Non Solvent Induced Phase Separation* (NIPS), asam humat.

ABSTRACT

Humic acid is one of the major constituents of Natural Organic Matter (NOM) commonly found in natural water sources. NOM compounds are undesirable contaminants in treated water therefore, an effective separation process is required to improve water quality. Polyvinylidene fluoride (PVDF) membranes are widely used in separation processes due to their excellent chemical, thermal, and mechanical stability. However, their hydrophobic nature limits membrane characteristics and filtration performance. This study aimed to investigate the effect of magnetic field induction on Fe_3O_4 nanoparticles toward the characteristics and performance of PVDF membranes for humic acid removal.

The membranes were fabricated using the Non-Solvent Induced Phase Separation (NIPS) method with three membrane configurations: pristine PVDF membrane, PVDF/Fe_3O_4 membrane containing 1 wt% Fe_3O_4 without magnetic field induction, and PVDF/Fe_3O_4 membrane containing 1 wt% Fe_3O_4 with magnetic field induction. Membrane characterization included morphology, water contact angle (WCA), mechanical strength, as well as Pure Water Flux (PWF) and humic acid rejection tests.

The results showed that the PVDF/Fe_3O_4 membrane fabricated under magnetic field induction exhibited a more homogeneous filler distribution and the best membrane characteristics, with a porosity of 84.31%, an EWC of 83.66%, a mean pore size of 87.23 nm, a WCA of 50.28°, and a tensile strength of 1.40 N/mm². This membrane also achieved the highest filtration performance, with a PWF of 569.23 $L \cdot m^{-2} \cdot h^{-1}$ and a humic acid rejection of 77.99%, outperforming both the pristine PVDF membrane and the PVDF/Fe_3O_4 membrane fabricated without magnetic field induction. Although the improvement resulting from magnetic field induction was relatively moderate, the results indicate that magnetic field-assisted fabrication enhances the distribution of Fe_3O_4 nanoparticles within the PVDF matrix, thereby improving membrane characteristics and filtration performance for humic acid removal.

Keywords: Membrane, PVDF, Fe_3O_4 filler, magnet induction, Non Solvent Induced Phase Separation (NIPS), humic acid.