

## **ABSTRACT**

*Membrane technology is an effective method for water purification, but fouling remains a major challenge. This study developed a self-cleaning composite membrane of Graphene Oxide (GO)/graphitic carbon nitride (g-C<sub>3</sub>N<sub>4</sub>)/Zinc Oxide (ZnO) with photocatalytic degradation capabilities. GO was synthesized using a modified Hummer's method, g-C<sub>3</sub>N<sub>4</sub> through calcination, and the GO/g-C<sub>3</sub>N<sub>4</sub>/ZnO composite was prepared via vacuum filtration with a nylon support membrane. ZnO concentrations ranging from 5% to 25% were applied, and maleic anhydride was used as a cross-linker. Characterization was conducted using FTIR, XRD, UV-DRS, and SEM-EDX Mapping. Filtration performance tests used Naphthol Blue Black solutions, while self-cleaning ability was tested under UV irradiation. The results indicated successful synthesis of the composite membrane, with FTIR spectra confirming the composite formation, increased interlayer spacing in XRD, and a uniform distribution of C, O, N, and Zn elements in SEM-EDX. The membrane's band gap ranged from 1.36 to 2.47 eV, with good UV-Vis absorption. Separation performance reached 99.9%, with the highest efficiency observed in the GO/g-C<sub>3</sub>N<sub>4</sub>/15.ZnO membrane (93% after four cycles), and the highest permeability in the GO/g-C<sub>3</sub>N<sub>4</sub>/17.5.ZnO membrane (225.2 L/m<sup>2</sup>.h.bar). This composite membrane demonstrated optimal performance in separation, permeability, and self-cleaning.*

**Keywords:** *Graphene Oxide, g-C<sub>3</sub>N<sub>4</sub>, ZnO, Composite Membrane, Self-Cleaning*