## *ABSTRACT*

*Separation and purification technologies of chemical substances are essential yet challenging components in chemical processes. Distillation-based separation techniques are commonly used; however, they are inefficient for separating azeotropic mixtures. Membrane-based separation, particularly pervaporation, offers a promising alternative due to its lower energy consumption and environmentally friendly nature. Graphene oxide (GO), with its two-dimensional structure and unique physicochemical properties, holds potential in water purification applications. This study aims to enhance the selectivity of GO membranes by intercalating GO with polyvinyl alcohol (PVA) and adding sodium alginate (SA) as a top layer, providing a membrane-based solution for ethanol dehydration. Graphene oxide was synthesized using the Hummers method, while the GO-PVA/SA composite membranes were fabricated via vacuum-assisted filtration onto a nylon support membrane. XRD analysis revealed a characteristic GO peak at $2\theta = 10°$ for the GO/SA variation, which shifted after PVA intercalation. FTIR spectroscopy indicated the emergence of new peaks after deposition on the support membrane. SEM-EDX demonstrated that the membranes possessed a smooth and homogeneous morphology, with $Ca^{2+}$ ions uniformly distributed on the membrane surface. Water contact angle measurements confirmed the superhydrophilic nature of the membranes, exhibiting angles below 10°. Separation performance tests showed that the highest performance was achieved by the GO-PVA/SA1 variation, with a flux of 1.834 $L \cdot m^{-2} \cdot h^{-1}$ and water purity reaching 98.49%, as evaluated by refractometry and GC-FID. The membrane also demonstrated good long-term separation stability over 60 hours.*



***Keywords:*** *separation, pervaporation, GO-PVA/SA, ethanol*