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ABSTRACT

Application of nano-composite membrane for environmental remediation- from Science to Society

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Because of the growing demands of new products and the increasingly stringent environmental regulations, more scientific innovations need to be implemented for solving societal challenges, economically and in more eco-friendly manner. This study aimed to develop and characterize a nanocomposite membrane by incorporating polyether sulfone (PES), graphene oxide (GO), and titanium oxide (TiO_2), with a specific focus on evaluating its efficacy in eliminating persistent pollutants from the environment. Hydrothermal method was employed synthesized TiO_2-GO composite. Then PES/TiO_2-GO nanocomposite membrane was fabricated using the nonsolvent phase inversion (NIPS) technique. Various analyses, including SEM/EDX, contact angle, mechanical strength were conducted including the Raman spectrum to investigate how GO and TiO_2 influenced the membrane's structure and hydrophilic properties. The membrane's performance was assessed in terms of pure water flux and its ability to remove reactive dye from contaminated water using a photocatalytic membrane reactor (PMR). The results demonstrated significant progress in dye degradation and removal during the separation process. Furthermore, the study examined the membrane's stability and reusability to measure its long-term effectiveness. The findings suggest that this hybrid matrix membrane not only exhibits exceptional dye removal capabilities but also maintains structural integrity over multiple usage cycles.
This practical results go from “Science to Society” where the research serves as reference point for stakeholders, policy makers dealing with sustainable water development strategies considering SDGs and circular economy to combat several environmental challanges.

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