

# Electrospun Carbon based PVA Membrane for Oil Water Separation and its Antifouling properties.

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## Abstract:

Challenges encountered whilst combating oil pollution, heightens the need for manipulation of advanced functional materials along with development of cost efficient design for oil-water separation. Carbon based Nanomaterials like Graphene, Graphene oxide (GO) and reduced graphene oxide (rGO) are potential materials for oil water treatment due to their unique physico-chemical, mechanical, with anti-swelling, antibacterial and antifouling properties. In this study, antifouling electrospun rGO-PVA nanocomposites were prepared by electrospinning technology. PVA membranes were also fabricated and compared with the PVA-rGO membranes. Due to rGO, Solution rheological properties were improved attributing to the reduction in fiber size, pore size and yielding long continuous fibers which prevented from the displacement of fibers during separation. This Composite Membrane exhibited higher tensile strength of about 52% increase than the control one. Improved Surface wetting properties were evidenced by Water contact angle and underwater oil contact angles resulting in higher and uniform water permeate flux of about 15,000 L/m<sup>2</sup>/hr for many cycles. This provides the feasibility of separating oil and water in low pressure conditions (100mm/Hg) for 15 recycling cycles. Bovine serum albumin (Model foulant) was used at (1mg/ml) concentration to evaluate the antifouling performance of the membranes. Further, the carbon based rGO exhibited antibacterial activity against *Staphylococcus aureus* and *Escherichia coli* with zone of clearance of 14.33 mm and 14.66mm respectively in agar well diffusion method. Hence these carefully designed carbon based PVA membranes are environment friendly, economically sustainable which serves the purpose of addressing issues on fouling, energy scarcity and combats the challenges faced by oil pollution.

**Keywords:** *Electrospinning, Carbon based Membranes, Oil-Water Separation, Antifouling Properties, Phytotoxicity Analysis.*