**Eco-friendly Cellulose acetate impregnated with MIP-202 bio‑MOF for water desalination using reverse osmosis**

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**Abstract**

Freshwater scarcity is a critical challenge that human society has to face during this century. Desalination of seawater by reverse osmosis (RO) membranes was regarded as the most promising technology to overcome the challenge. Nowadays, regrading to the environment concern, there is an urgent need for high desalination efficiency membrane with environmentally friend properties. Consequently, a novel fully eco-friendly mixed matrix membrane was fabricated from the natural based cellulose acetate (CA) polymeric membrane incorporated with biocompatible MIP-202 zirconium based bio-metal organic framework material as eco-friendly hybrid membrane. The physical, chemical and mechanical properties of the fabricated CA/MIP-202 hybrid membrane were evaluated using Fourier transform infrared (FTIR), X-ray diffractometer (XRD), scanning electron microscope, thermal gravimetric analysis, and contact angle. FTIR and XRD data confirmed the successful fabrication of the hybrid polymeric membrane CA/MIP-202. Further, the results proved the MIP-202 nano-fller impregnation at the hybrid CA/MIP-202. It was evident that the incorporation of nano-bio-MOF had a slight positive impact on the membrane thermal stability. The contact angle decreased with the impregnation of bio-MOF. The RO membrane performance revealed that the eco-friendly hybrid CA/MIP-202 recorded 92.8% and a permeate water flux of 6.2 L/m2 h compared with 80% salt rejection and a permeate water flux of 4 L/m2 h for the free cellulose acetate membrane. Accordingly, the fabricated CA/MIP-202 hybrid membrane is suitable for water desalination as a bio-membrane and compatible with the environment.

**Keywords**: water desalination, reverse osmosis, eco-membrane, cellulose acetate, bio-MOF, MIP-202

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