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Thermally and chemically stable poly(arylene ether nitrile)/halloysite nanotubes intercalated graphene oxide nanofibrous composite membranes for highly efficient oil/water emulsion separation in harsh environment

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Abstract:

Oil/water emulsion sewage separation in strong corrosive and high-temperature harsh environment is a big challenge for polymer-based filtration membrane system due to the intrinsic defect of polymers. In this work, we demonstrated novel thermally and chemically stable composite membranes consisting of halloysite nanotubes (HNTs) intercalated graphene oxide (GO) coating on porous poly(arylene ether nitrile) (PEN) nanofibrous mat, which were prepared by controlled assembly of HNTs intercalated GO (skin layer) onto the surface of electrospun PEN nanofibrous mats (supporting layer) and further mussel-inspired polydopamine coating. Typically, the micro-/nano- rough structure and hydrophilic property of polydopamine contributed to super-hydrophilic and underwater super-oleophobic nature of composite membranes. Therefore, the resulting composite membranes exhibited high preferable rejection ratio (more than 99.0 %) and remarkable antifouling performance for various oil/water emulsions. Furthermore, flexible channel control of skin layer by intercalation of HNTs, porous PEN supporting layer, and super-wetting property endowed the composite membranes with high permeate flux (1130.56 L/m^2·h). More

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