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Poly (triethoxyvinylsilane-co-quaternaryvinylbenzylchloride)/*f*GNR based Anion Exchange Membrane and its Application towards Salt and Acid Recovery

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A novel synthetic route is reported for the preparation of anion exchange membrane and its application towards desalination via electrodialysis and acid recovery via diffusion dialysis. In current study a copolymer based on triethoxyvinylsilane and quaternized vinyl benzyl chloride was synthesized by free radical polymerization using AIBN as an initiator. Further, the property of copolymer was improved by adding different concentration of functionalized graphene nano-ribbons (*f*GNR). Structural, chemical and morphological parameters was confirmed by FT-IR, AFM, SEM and TEM anlysis. Prepared membrane shows excellent thermal, mechanical and chemical stability by the addition of *f*GNR. The performance of copolymer was analyzed in terms of electrochemical and physicochemical system. The PGR-5 membrane shows hydroxyl ion conductivity of 1.60 x 10^{-2} S/cm, which is found to be double at 90^{0} C. The IEC of the membranes was also improved by addition of *f*GNR. In summary increasing the amount of *f*GNR in membrane matrix, IEC, ionic conductivity, hydration number, elastic modulus, thermal stability etc. increases while swelling ratio reduces by 30 % for PGR-5 membrane compared to PVSi. Prepared composite membranes shows lower power consumption 1.36 kWh/kg with high current efficiency 88.68% for salt removal by electrodialysis. For recovery of HCl, PGR-5 membrane shows its superiority with dialysis coefficient of 0.053 m/h and separation factor of 41. Results show that PGR-5 membrane is a good candidate for electro-membrane processes and diffusion dialysis.

Key words: GNR; Composite Anion exchange membranes; Ionic conductivity; Diffusion Dialysis; Water desalination.