



## Zwitterionic multisilicon copolymer used for preparing PVA based hybrid membranes for alkali recovery

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### ABSTRACT

Zwitterionic multisilicon copolymer is prepared from the copolymerization of 2-acrylamide-2-methyl-1-propanesulfonic acid and  $\gamma$ -methacryloxy propyl trimethoxyl silane, which contain  $-\text{NH}_2$ ,  $-\text{SO}_3\text{H}$  and  $-\text{Si}(\text{OCH}_3)_3$  groups. The copolymer is then taken sol-gel reaction with polyvinyl alcohol to form hybrid membranes. The hybrid membranes are strong acidic and weak basic, which are used in diffusion dialysis (DD) process for alkali recovery. The hybrid membranes are generally homogeneous and compact. The initial decomposition temperature values are in the range of 204°C–210°C and the  $T_g$  values are in the range of 225°C–231°C. The highest value of tensile strength is 51.8 MPa and the elongation at break ( $E_b$ ) is in the range of 72.1%–289.7%. The membranes have the water uptake ( $W_R$ ) of 27.7%–88.3% and cation exchange capacity of 0.90–2.15 mmol  $\text{g}^{-1}$ . The DD process shows that the dialysis coefficient of NaOH ( $U_{\text{OH}}$ ) is in the range of 0.0079–0.0151  $\text{m h}^{-1}$  and the selectivity (S) can reach up to 32.7. The favorable performances are attributed to the combining effect of  $-\text{OH}$ ,  $-\text{NH}_2$  and  $-\text{SO}_3\text{H}$  groups.

**Keywords:** Multisilicon copolymer; Zwitterionic hybrid membrane; Polyvinyl alcohol (PVA); Diffusion dialysis (DD); Alkali recovery

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