

Controlling methanol and water diffusion in Nafion via amine treatment

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Nafion is being used worldwide as a constituent of separation membranes [1-3] and as a proton-conductive membrane in fuel cells [4] and membrane in the chlor-alkali industry [5]. In these applications, the relation between methanol and water diffusivities is crucial. As Nafion is a polymeric perfluorosulfonic acid skeleton which is terminated by reactive sulfo-groups, we provide to control the diffusivity of water and methanol by treating Nafion with primary amines. Nafion was thus modified with a series of three primary amines and sodium hydroxide. All modified membranes were tested using vapour sorption microgravimetry method; sorption capacities and diffusion coefficients were measured [2] and compared to those of pure Nafion and of its sodium salt. The modifications of Nafion by ethanolamine and benzylamine resulted in the elimination of the degradation (spontaneous darkening), which is typical to pure Nafion [1-3]. Interestingly, Nafion modified with ethanolamine showed higher diffusivity of water than of methanol, which contrasts with the properties of all other Nafion modifications, pure Nafion and its sodium salt.

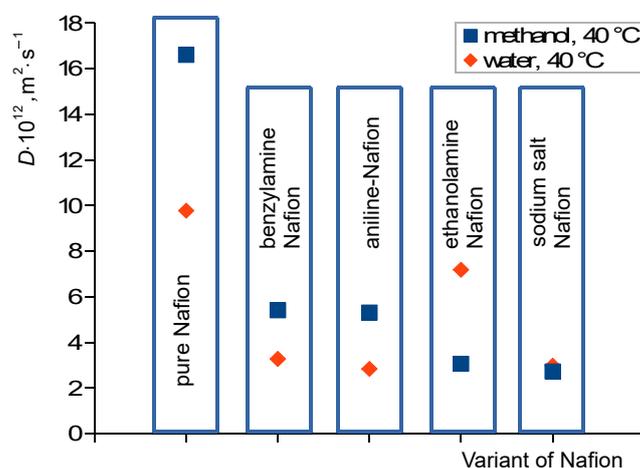


Figure 1: Diffusivities of water and methanol in modified Nafions at 40 °C and vapour activity of 0.5.

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References

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