ナフィオン (Nafion®) 117 及びスルホン化ポリエーテルエーテルケトン (SPEEK) におけるプロトンダイナミクス・形態学的効果

Morphology Effect on Proton Dynamics in Nafion® 117 and Sulfonated Polyether Ether Ketone (SPEEK)

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We report results of our experimental and theoretical studies on the dynamics of proton conductivity in Nafion® 117 and self-fabricated sulfonated polyether ether ketone (SPEEK) membranes.[**?**, **?**] Knowing that the presence of water molecules in the diffusion process results in a lower energy barrier, we determined the diffusion barriers and corresponding tunneling probabilities of Nafion® 117 and SPEEK system using a simple theoretical model that excludes the medium (water molecules) in the initial calculations. We then propose an equation that relates the membrane conductivity to the tunneling probability. We recover the effect of the medium by introducing a correction term into the proposed equation, which takes into account the effect of the proton diffusion distance and the hydration level. We have also experimentally verified that the proposed equation correctly explain the difference in conductivity between Nafion® 117 and SPEEK. We found that membranes that are to be operated in low hydration environments (high temperatures) need to be designed with short diffusion distances to enhance and maintain high conductivity. Further details will be discussed at the conference.

参考文献

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