Electrochemical and mechanical durability of the sulfonated poly(arylene ether sulfone) membrane for polymer electrolyte fuel cells

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The sulfonated poly(arylene ether sulfone) (SPES) with comparable proton conductivity compared to Nafion have being developed because that have some advantage such as low manufacturing cost and gas permeability, and high glass transition temperature. The purpose of this paper is to investigate effect of the electrochemical and mechanical degradation and to present ways to increase membrane durability on the sulfonated poly (arylene ether sulfone) membrane in fuel cells. As protocols, the OCV hold test, 80° C/10% RH, and RH cycle test, 80°C/0 to 100%, were used in this study. The M-SPES with degree of sulfonation 50 shows higher OCV durability and mechanical stability than H-SPES with degree of sulfonation 40 due to the increasing molecular weight of the membrane. Additionally, the mechanical stability of the R-SPES reinforced by polyimide nonwovens substrates was five times higher than H-MEA. As a result, the inducing ionomer with high molecular weight and reinforcement was required to improve electrochemical and mechanical durability for the SPES membrane.