직접메탄올 연료전지의 메탄올 크로스오버에 대한 시뮬레이션 및 검증

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Simulation and Validation of Methanol Crossover in DMFCs

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In direct methanol fuel cells(DMFCs), it is well known that methanol crossover severely reduces the cell performance and the cell efficiency. There are a number of design and operating parameters that influence the methanol crossover. This indicates that a DMFC demands a high degree of optimization. For the successful design and operation of a DMFC system, a better understanding of methanol crossover phenomena is essential. The main objective of this study is to examine methanol-crossover phenomena in DMFCs. In this study, 1D DMFC model previously developed by Ko et al. is used. The simulation results were compared with methanol-crossover data that were measured by Eccarius et al. The numerical predictions agree well with the methanol crossover data and the model successfully captures key experimental trends.

Key words : Direct Methanol Fuel Cell(직접 메탄올 연료전지), Methanol Crossover(메탄올 크로스오버), Diffusion (확산), Electro-osmotic Drag(전기삼투압), Validation(검증)

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Synthesis and Characterization of Proton Conducting Graft Copolymer Membranes

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The "*grafting from*" technology to prepare the well-defined microphase-separated structure of polymer using atom transfer radical polymerization (ATRP) will be introduced in this presentation. Various amphiphilic comb copolymers were synthesized through this approach using poly (vinylidene fluoride) (PVDF), poly (vinylidene fluoride-co-chlorotrifluoroethylene) (P(VDF-co-CTFE) and poly(vinyl chloride) (PVC) as a macroinitiator. Hydrophilic side chains such as poly (styrene sulfonic acid) (PSSA) or poly (sulfopropyl methacrylate) (PSPMA) were grafted from the mains chains using direct initiation of the chlorine atoms. The structure of mass transport channels has been controlled and fixed by crosslinking the hydrophobic domains, which also provides the greater mechanical properties of membranes. Successful synthesis and microphase-separated structure of the polymer were confirmed by ^{1}H NMR, FT-IR spectroscopy and TEM. The grafted/crosslinked membranes exhibited good mechanical properties (400 MPa of Young's modulus) and high thermal stability (up to 300℃), as determined by a universal testing machine (UTM) and TGA, respectively.

Key words : polymer electrolyte membrane(고분자 전해질막), graft copolymer(가지형 공중합체), proton conductivity (수소이온 전도도), atom transfer radical polymerization(원자전달 라디칼 중합)

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