포스터 발표 P-3

설폰화 폴리아닐렌 공중합체 합성 및 특성

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Synthesisandcharacterizationofsulfonatedpoly(arylene ethersulfone)copolymerwithmodifiedbisphenol

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1. Introduction

A direct methanol fuel cells (DMFCs) using polymer electrolyte membranes are one of the most attractive power sources for a wide range of application from vehicles to portable utilities due to the stable operation at a rarely low temperature, the high energy generation yield and energy density, the simplicity of system.

Many efforts to synthesize cost-effective and thermally stable alternative membranes, including sulfonated poly(arylene ether sulfone) copolymer polybenzimidazoles, poly(ether ether ketone)s, and substituted polyphenylenes have been initiated, and several have continued to attract interest[1]. Poly(arylene ether sulfone)s are important, well-known engineering thermoplastics that display excellent thermal and mechanical properites, as well as resistance to oxidation and acid catalyzed hydrolysis[2].

In our study, sulfonated poly(arylene ether sulfone) membranes containing a carboxyl group in its side chain and modified bisphnol have been synthesized by the nucleophilic displacement reaction of 4,4′-dichlorodiphenyl sulfone, sulfonated 4-4′-dichlorodiphenyl sulfone, and phenolphthalin.

Their water swelling, ion exchange capacity, proton conductivity were investigated in an attempt to characterize membranes for DMFC application.

2. Experimental

Phenolphthalin (PP), N-phenylmaleimide, and hydrazine monohydrate were purchased from Aldrich Chemical Co. and used as received. Monomer grade 4,4′-dichlorodiphenyl sulfone(DCDPS) was received from Aldrich and dried in a vacuum oven for at least 12h at 100oC. N-Methyl-2-pyrrolidinone and N,N-Dimethylacetamide was purified by distillation. Other reagents and solvents were obtained from Aldrich and used as received.

The bisphenol monomer (3,8-bis(4-hydroxyphenyl)- N-phenyl-1,2-naphthalimi, IB) was prepared from phenolphthalein and N-phenyl maleimide as previously reported [3]

To prepare the sulfonated poly(arylene ether sulfone) membrane, first SDCDPS monomers were synthesized (Fig. 1) via sulfonation method suggested by William et al [4], and then polymerized them with phenolphthalin(PP), IB and 4,4′-dichlorodiphenyl sulfone (DCDPS).

3. Results and discussion

Sulfonated poly(arylene ether sulfone) copolymers were synthesized with controlled degrees of disulfonation of up to 50 mol%via the direct copolymerization of sulfonated aromatic dihalides, aromatic dihalides, and one of two structurally distinct bisphenols. Figs.1-2 shows a structure and 1H-NMR spectrum of the modified bisphnol and synthesized polymer membrane. The proton conductivity of the membranes under vapor condition (RH 95%) was measured as a function of the bisphnol monomer concentration and temperature. The prepared proton exchange membranes at each preparation condition possessed the proton conductivity in the range of 10-3 ~ 10-2 S/cm.

4. References

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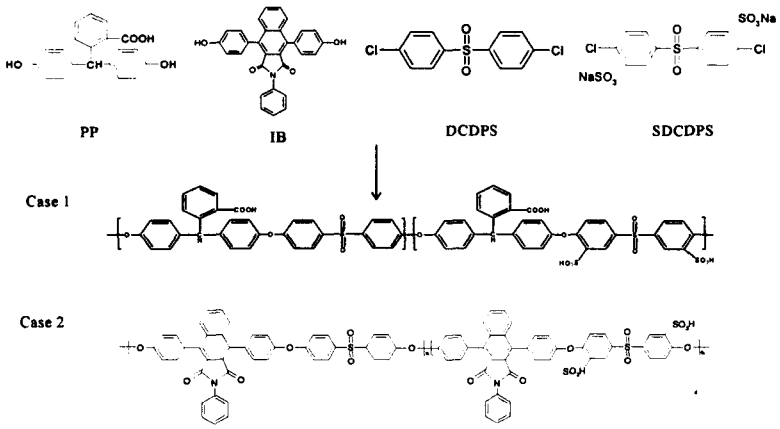

Fig. 1 structure of sulfonated poly(arylene ether) copolymer

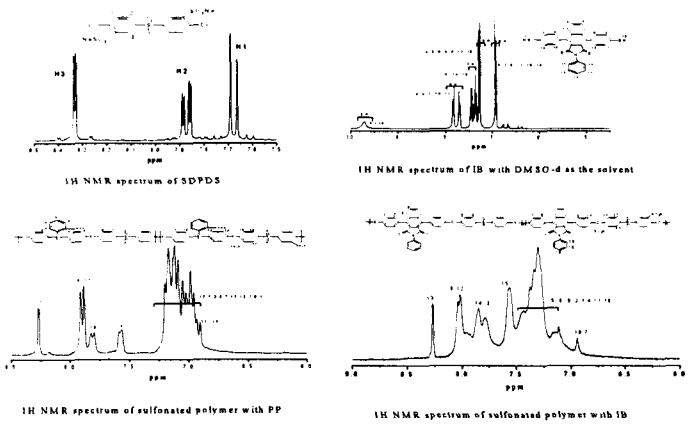

Fig. 2 ^{1}H NMR spectrum of monomer and sulfonated poly(arylene ether) copolymer