일반강연 I-3

통합형 Polyetherimide 나노막 제조 및 특성평가

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Preparation and Characterization of Integrally Skinned Uncharged Polyetherimide Asymmetric Nanofiltration Membrane

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1. Introduction

The composite polyamide membranes prepared by the interfacial polymerization have drawbacks of their susceptibility against free chlorine and alkaline which causes degradation of the amide group [1,2]. Jegal and Lee have reported that NF membrane could be prepared from poly(vinyl alcohol) and sodium alginate in order to overcome drawbacks of composite polyamide membranes [3]. In such membranes, the toplayer and the sublayer are composed of different polymeric materials so that each layer should be optimized separately. Moreover, it is very difficult to make a hollow fiber composite membrane. Therefore, in order to overcome these drawbacks of the composite membrane, there

is a need to prepare the integrally skinned asymmetric membrane suitable for NF membrane application.

The purpose of this study is to prepare the integrally skinned asymmetric membranes and determine the optimum conditions for a good performance NF membrane. In addition, asymmetric membranes were prepared by the dry/wet phase inversion. The effects of 1,4-dioxane additive on the membrane properties and morphologies were studied.

2. Experimental

2.1. Materials

Polyetherimide (PEI, Ultem 1000) made by General Electric was used as membrane material. The polymer was dried for at least 5h at 100℃ before being used in preparing the polymer solution. Dimethyl formamide (DMF) and 1,4-dioxane were purchased from Aldrich and used as solvents. Deionized (DI) water was used as a coagulation media.

2.2. Membrane preparation

PEI was dissolved at 60℃ in multi-component solvents to form a polymer solution. The casting solution was kept at room temperature for 24h and then cast on a polypropylene non-woven fabric with a doctor knife having 200㎛ thickness. The nascent membrane was directly immersed (no evaporation) in a DI water coagulation bath. After the immersion, the membranes were washed for 12h to remove all solvents.

3. Results and Discussion

In order to prepare the integrally skinned nanofiltration (NF) membrane, the cosolvent system was used. With increasing the content of 1,4-dioxane, the pore size of membranes became smaller. The molecular weight cut-off (MWCO) values were in the range of 2000 to 6000. Large polarity of 1,4-dioxane shares more solvent in the casting

solution. Thus the polymer is more aggregated and forms denser layer when 1,4-dioxane is used as an additive.

4. References

[1] M. Mulder, Basic Principles of Membrane Technology, Kluwer, London, 1996.

[2] R. E. Kesting, Synthetic Polymeric Membranes, Wiley, New York, 1985.

[3] J. G. Jegal and K. H. Lee, Nanofiltration membranes based on poly(vinyl alcohol) and ionic polymers, J. Appl. Polym. Sci., 72 (1999) 1755-1762.

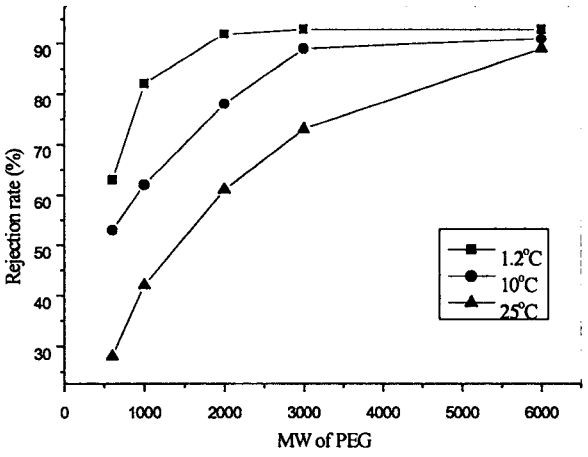

Figure The 1,4-dioxane effect on performance of 16wt% PEI membrane cast at 25℃ and 65% relative humidity (no evaporation) and coagulated at DI water.