포스터 발표 P-6

초극세 중공사형 세라믹 정밀여과막 제조

최인환, 김인철, 이규호
한국화학연구원 분리막다기능소재연구센터

Preparation of a ultrathin hollow fiber ceramic microfiltration membrane

In-Hwan Choi, In-Chul Kim and Kew-Ho Lee

Membranes and Separation Research Center,
Korea Research Institute of Chemical Technology

1. Introduction

Various polymeric hollow fiber membranes have been prepared and been used widely due to their high surface area per unit volume and high permselectivity. However, the organic materials are only limited to mild operating conditions because of their weak thermal stability and ease of fouling. In contrast, inorganic membranes prepared from microporous glasses, ceramic materials such as aluminium oxide (Al2O3), metal oxide or metal alloys have relatively high resistance to abrasion and to chemical and thermal degradation, and thus most appropriate for use in severe operating conditions such as corrosive environments and high temperatures. The inorganic membranes are not only used directly in microfiltration, ultrafiltration, and gas separation at high temperatures, but also served as porous supports for dense

membrane formation [1-2].

In this study, we prepared a ceramic hollow fiber by using the well-known phase inversion method. Factors affecting the structure such as the sintering temperature and the ratio of the aluminium oxide to the polysulfone polymer binder were studied extensively, and the formation procedures of the inorganic hollow fiber membrane were also discussed.

2. Experimental

2.1. Slurry preparation

10wt% of polysulfone as a polymer binder was dissolved in aluminium oxide (Al2O3, 0.4μm, Tsumitomo) dispersed solvent mixtures (DMAc and 1,4-dioxane). 2wt% of MgO was contained in the Al2O3 particles. Prior to adding polymer binder, Al2O3 was dispersed in the solvent mixture by ball milling. A dispersing agent and a anti-foaming agent were added.

2.2. Formation of hollow fiber membranes

The degassed dope containing the dispersed Al2O3 powders was pressurized to 70psig using nitrogen. A spinneret with orifice diameter/inner diameter of 3.0/2.0 was used to obtain hollow fiber precursors. Finally, the forming hollow fiber precursor was immersed in a water bath to complete the solidification process. The hollow fiber precursors were heated in the furnace at about 60 0℃ for 2hr to remove the organic polymer binder, and then calcined at a high temperature of 1300-1400℃.

Membrane surface and cross-section were determined by SEM. The surface porosity was measured by mercury porosimeter.

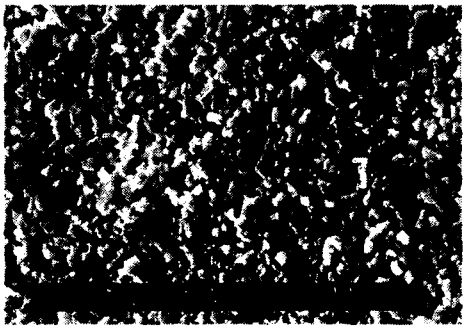
3. Results and Discussion

Inorganic hollow fiber membranes have been prepared by spinning a polymer solution containing dispersed Al2O3 powders to a hollow fiber precursors, which is then sintered at elevated temperatures. The resulting average pore size and porosity were 0.1um and 40% determined by SEM and mercury porosimeter. Too high sintered temperature resulted in very low porosity.

4. References

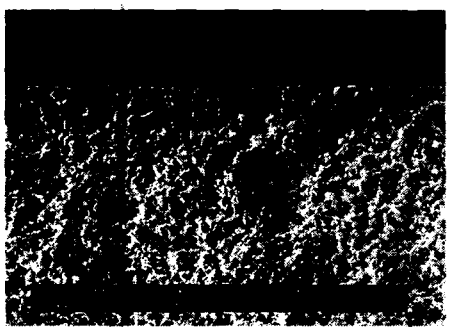
[1] X. Tan, S. Liu and K. Li, Preparation and characterization of inorganic hollow fiber membranes, *J. Membrane Sci.*, **188** (2001) 87-95.

[2] S. Liu and K. Li, Preparation TiO2/Al2O3 composite hollow fiber membranes, *J. Membrane Sci.*, **218** (2003) 269-277.



(a)

(b)



(c)

Figure The morphology of ceramic hollow fiber membrane.