

## RA-8

### The Effect of $\text{ZnCl}_2$ on Polysulfone Membrane

Sue Ryeon Kim, Kew Ho Lee\* and Mu Shik Jhon

Department of Chemistry,  
Korea Advanced Institute of Science and Technology,  
Taejon, Korea

\*Advanced Polymer Division,  
Korea Research Institute of Chemical Technology,  
Taejon, Korea

The study was undertaken to investigate the effects of  $\text{ZnCl}_2$  in polysulfone(PSf)/N-methylpyrrolidone(NMP) on the structure and performance of its membrane. The effects of additives on the performances of membranes have been studied. It has been shown that some low molecular weight additives in polysulfone(PSf) casting solutions have effects on the performances of membranes cast from these solutions. It had been reported that  $\text{ZnCl}_2$ , as the additives in PSf casting solution, decreases water permeability and increases the rejection rate of its membrane. As shown in Fig., it was confirmed that the addition of  $\text{ZnCl}_2$  in casting solution increase the rejection on the membrane. Because the PSf membrane made by phase inversion is asymmetric membrane, pore size distribution at skin layer determines its performance. So, understanding the structure of skin is important in characterizing the membrane. Smolders et al. suggested that as soon as the cast film is immersed in the nonsolvent bath, a rapid depletion of solvent from the film and a relatively slow penetration of nonsolvent occur, and then the skin is formed by gelation. This phase inversion at skin layer, of course, occurs very rapidly. We could think that the correlation between the structure of

polymer in solution and that at skin is important. The measurements of reduced viscosities of PSf in solution with various concentration of  $ZnCl_2$  showed that the addition of  $ZnCl_2$  induces the associated PSf chain. NMR and IR spectra indicated that  $ZnCl_2$  interacts with NMP, not with PSf. It was concluded that  $ZnCl_2$  interacts with NMP and extracts NMP which solvate the PSf chain, in turn, aggregates PSf chain. SEM pictures show no change at the membrane of  $ZnCl_2$  contained solution. From these results, we propose that the casting solution containing associated PSf chain induces skin layer with smaller pore.

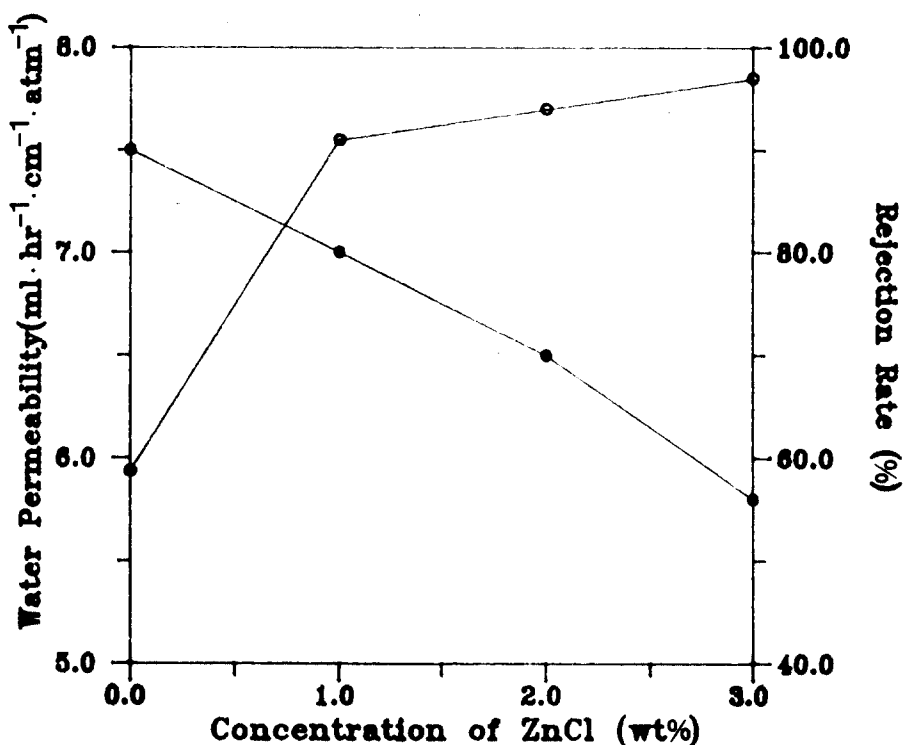


Fig. The water permeability and the rejection of polyethyleneglycol ( $M_w = 40,000$ ) solution through PSf membrane containing  $ZnCl_2$ .