일반강연 2-11

PREPARATION AND MICROSTRUCTURE CHANGES WITH SWELLING OF POLYION COMPLEX MEMBRANES BASED ON THE *K*-CARRAGEENAN

Jonggeon Jegal and Kew-Ho Lee

Membrane and Separation Lab., Advanced Polymer Division, Korea Research Institute of Chemical Technology, P.O.Box 9, Daedeog Danji, Taejon, 305-606, Korea

ABSTRACT

In order to prepare polyion complex membranes useful for the separation of water-alcohol by pervaporation, k-carrageenan containing anionic sulfate groups in the backbone and good hydrophilicity was selected for the polyanion membrane material and poly{1,3-bis[4-butyl pyridinium] propane. bromide}, one of the polycations synthesized in our lab[1] and containing cationic pyridinium groups., was used. The polyion complex membranes were prepared by the ion complex formation between k-carrageenan films and poly{1,3-bis[4-butyl pyridinium] propane. bromide}. On the formation process of polyion complex membranes, the way of polyion complex formation was carefully studied. In order to study the effect of the morphology on the permeation properties of the polyion complex membranes, which is one of the important factors affecting on the permeation properties of membranes but rarely studied, the microstructure behaviors of the polyion complex membranes in methanol-water mixtures with different compositions were also studied with x-ray diffractometry and polarizing microscopy.

Polyion complex membranes based on k-carrageenan were prepared by the ion complex formation (crosslinking) between the sulfate anion of k-carrageenan (polyanion) and the pyridinium cation of the poly{1,3-bis[4-butyl pyridinium] propane. bromide} (polycation). On the preparation of polyion complex membranes, ion complex was formed from the surface of the k-carrageenan film in the aqueous solution of the polycation and subsequently polyion complex membranes with a crosslinked layer wrapping the internal uncrosslinked k-carrageenan parts was prepared. The crosslinking density of the polyion complex membrane will be able to be controlled by using polycations with different ion contents. On the other hand, the morphology (macromolecular behavior) of the internal uncrosslinked polyanionic part of the polyion complex membrane was changed under different circumstances. The uncrosslinked polyanionic part was changed in the morphology with different degree of swelling as follows; semicrystalline in dry state; Smectic mesophase in swollen state with swelling index, 0.7; and Nematic state in

swollen state with swelling index, 2.57. From this study, it was found that it could be possible to prepare membranes in which the crosslinked part and uncrosslinked part could be controlled separately and consequently the optimum membrane structure for the separation of water-alcohol mixtures by pervaporation could be obtained.

REFERENCES

1. J.G. Jegal, J.H. Kim, Y.I. Park, and K.H. Lee, *J. Appl. Polym. Sci.*, (1994) In press.

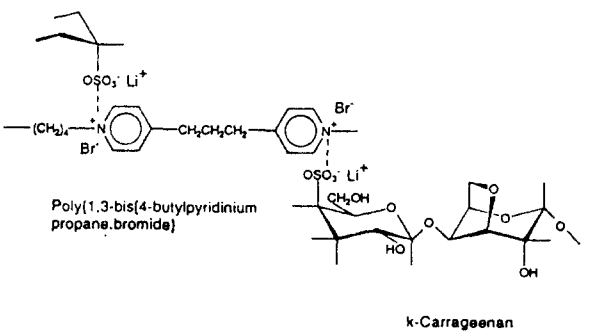

Figure 1. Chemical structures of the k-carrageenan (polyanion) and poly[1,3-bis[4-butyl pyridinium] propane. bromide] (polycation) and schematic presentation of the polyion complex formation between them.

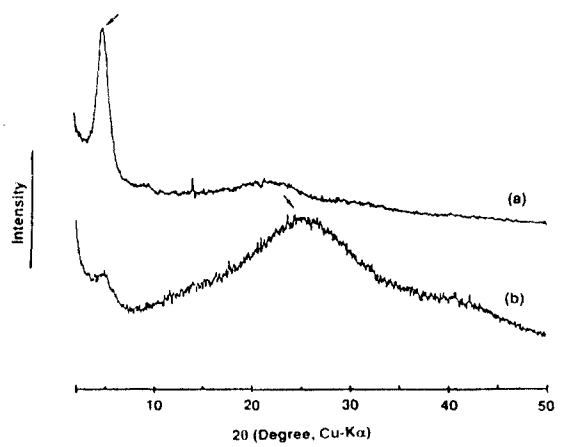

Figure 3. X-Ray diffractograms of swollen k-carrageenan membranes in (a) Smectic mesophase and (b) Nematic mesophase.

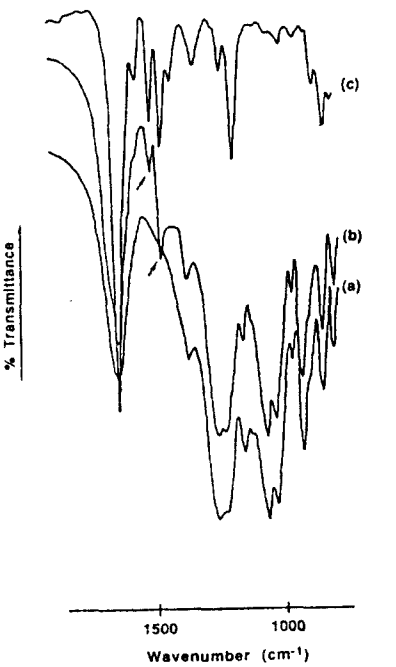

Figure 2. FT-IR spectra of (a) the k-carrageenan membrane, (b) the polyion complex membrane and (c) the poly[1,3-bis[4-butyl pyridinium] propane. bromide].