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SYNTHESIS AND CHARACTERIZATION OF THE POLYCATIONS FOR THE PREPARATION OF POLYION COMPLEX MEMBRANES

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Pervaporation has become important as a method to separate liquid mixtures, sepecially azeotropic and close boiling-point mixtures. Especially, water-alcohol separations have been carried out a lot because of the practical interests in the industries. However, outstanding membranes with high selectivity and high permeability have not been available in common use yet.

In order to separate selectively out the water mixed with alcohols with an aim of the purification of the alcohols, a membrane has to have excellent affinity to water. Among the hydrophilic polymers, polyacrylic acid and poly(vinyl alcohol) are used widely. In recent years, ionomers and polyion complexes, better hydrophilic materials, start to be used. The polyion complex membranes, consisting of polyacrylic acid (PAA) and polycation, showed excellent permeation rates and selectivities. It was known that among the polycations, ionenes, which have quaternary ammonium groups in the backbone chain, were more effective in giving membranes of higher permselectivities. On this base, syntheses and characterizations of the polycations, with different chemical structures from the published ones, for the polyion complex membrane formation were studied in this paper.

Polycations with bromide or p-toluenesulfonate as a counter ion were polymerized from the reaction of the 1,3-di-pyridyl propane with dibromoalkane such as 1,4-dibromobutane or di-p-toluenesulfonylalkane such as 1,8-di-p-toluenesulfonyloctane at the high temperature for 3 days. All the polycations were very hygroscopic and soluble in the water but some polycations were insoluble or less soluble in less polar solvents such as ethanol or propanol. The polycations showed glass transition temperatures and crystal melting points, as well as the thermal transition points of dehydration, varying from one polycation to another, on the scans with a differential scanning calorimeter (DSC). The crystallinities and the crystal lattice distances (d) of the polycations were studied with a X-ray diffractometer and all the polycations showed some crystallinity with little bit different lattice distances.