

## Preparation of Anion Exchange Paper Membrane for Treating Radioactive Waste and Evaluation of Ion Transport Characteristics

Inoue Hiroyoshi\* and Kaibara Kozue\*\*

\*Radioisotope Institute for Basic and Clinical Medicine, Kurume University School of Medicine.

\*\*Department of Chemistry, Faculty of Science, Kyushu University

### Summary

The use and disposal of radioactive waste containing  $^{125}\text{I}$  is strictly regulated by laws because  $^{125}\text{I}$  is readily absorbed into the body and represents a significant health hazard. The regulations are most commonly complied with by storing the radioactive waste appropriately and allowing the material to decay naturally. Many researchers have investigated the possibility of reducing the volume stored material by filtering  $^{125}\text{I}$  from general radioactive waste through the use of columns packed with an anion exchange resin or activated charcoal. Although some of these techniques provide high rates of  $^{125}\text{I}$  removal, column-based methods are problematic in that the apparatus is typically bulky, the columns require frequent regeneration, and the regeneration process generates new radioactive waste. In the present study, we examine the characteristics of anion exchange paper membrane with high  $^{125}\text{I}$  permselectivity using a new type paper membrane, prepared by using an epoxy propyltrimethylammonium group. We systematically analyzed the ionic electrochemical properties of a  $\text{Na}^{125}\text{I}$  or  $\text{Na}^{36}\text{Cl}$  concentration-cell system using the prepared anion exchange membrane on the basis of nonequilibrium thermodynamics.

The electroconductive membrane permeability of  $^{125}\text{I}$ , representing the solution/membrane ion distribution due to electrostatic effects, is higher than that for  $^{36}\text{Cl}$  in all cases. On the other hand, the diffusional membrane permeability of  $^{125}\text{I}$ , representing the migration speed of ions within the membrane phase, is almost same as that for  $^{36}\text{Cl}$ . In the paper membrane treated with an epoxy propyltrimethylammonium group,  $^{125}\text{I}$  solution/membrane distribution process is effective to separate  $^{125}\text{I}$  from radioactive waste that has been contaminated with chloride ion. These findings indicate the potential utility of paper membranes prepared in this way.