

Design and development of pore-filling type ion-exchange membranes for electro dialysis

Takeo Yamaguchi

Department of Chemical System Engineering
The University of Tokyo

Summary

Most of polymer electrolyte membrane needs water for the ion migration, however, the membrane swelling leads to low mechanical strength. To control the membrane swelling and mechanical strength, we proposed a pore-filling membrane concept. This pore-filling ion-exchange membrane is composed of two materials: a porous substrate, and a graft or gel type polymer electrolyte that fills the pores of the substrate. The porous substrate is completely inert to liquids and has mechanically strong matrixes, and water can be contained in the filling polymer electrolyte for ion migration. The filling polymer exhibits ion conductivity, and the porous substrate matrix mechanically prevents excess swelling of the filling polymer. In addition, the substrate matrix restricts the change in membrane area from the dry to the swollen state. Changing the filling polymer ratio in the substrate, water uptake, dimensional stability and ion migration can be controlled.