Preparation of anion conducting ionomer dispersions

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Efforts are recently devoted to alkaline fuel cells using anionic polymeric membranes. Proton exchange membrane fuel cells (PEMFCs) have received great attention for a decade due to their high efficiencies and ability to operate without greenhouse gas emissions. Despite its advantages, issues on slow cathodic kinetics, difficult water management, and the requirement for expensive platinum-based catalysts have been being increased. However, if alkaline polyelectrolyte membranes are employed in fuel cells, then several potential benefits can be expected such as facile kinetics at the cathode, available non-noble metal catalysts such as nickel and silver, easier water management, and minimizing electrode weeping and component corrosion. For fuel cell applications, membrane-electrode assemblies(MEAs) should be prepared. In the electrodes the composition of anion-conducting ionomer binder and elelctrocatalyst is required to be optimized for maximum performance of solid alkaline fuel cells. However, few scientist studied ionomer binder solutions for preparation of electrodes of MEAs in solid alkaline fuel cell.. Polyvinyl alcohol(PVA) was selected as the backbone material of ionomer binder in my study because PVA is highly resistant to against acid, alkali and organic reagents and the production cost of PVA is relatively low. Moreover, it has a number of unique properties such as excellent film forming, non-toxic, odorless, high tensile strength, flexibility. In this paper, we investigated a new water-soluble PVA binder solution. A water-soluble PVA derivative, *N*-[(2-hydroxy-3-trimethylammonium)-propyl] PVA chloride was prepared by reacting PVA with glycidyltrimethyl- ammonium chloride. To dissolve *N*-[(2-hydroxy-3-trimethylammonium)propyl] PVA chloride into D.I Water, *N*- [(2-hydroxy-3-trimethylammonium) propyl] PVA chloride were added into different flasks containing a freshly prepared D.I Water, and mixtures were stirred at 60^{o}C for 2~3 h. For crosslinking of quaternized PVA membranes, glutar aldehyde (GA) was introduced with 2.0 M HCl. The properties of PVA based membranes were investigated with respect to the degree of quaternization and crosslinking.

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