

Applying new polymers containing phosphate as the electrode binder for high temperature PEMFC

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The high-temperature polymer electrolyte membrane fuel cell (HT-PEMFC) is operated between 120 °C and 180 °C, so it can't use the Nafion® as a binder for the electrodes because proton conductivity of the Nafion® is very low without water. Therefore, the HT-PEMFC used phosphoric acid (PA) to conduct protons from the anode to the cathode and binder, such as polyvinylidene fluoride (PVDF), to maintain the electrode structure. In this study, the polymers having the phosphate group as a functional group, that has a proton conductivity under the low humidity, is attempted to use as a new binder for the HT-PEMFC. Hydrocarbon-based polymers were used because they are stable at high temperatures. The polymer containing phosphate in the side chain was synthesized by Arbuzoy reaction. There are three types of polymers depending on the length of side chain. The binder had the longer the side chain, the higher the performance. The NMR and FT-IR showed the changes of interaction between a binder and organic additive at high temperature. The optimization of performance will be discussed.