Enhanced performance of high temperature proton exchange membrane fuel cell by adding an additive to gas diffusion electrode

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Although high-temperature proton exchange membrane fuel cells (HT-PEMFCs) have tolerance to carbon monoxide and overcome water management challenges, their practical applications are limited due to their low performance compared to the low-temperature PEMFC. In the HT-PEMFCs, phosphoric acid (PA) behaves as a proton conductor in the polymer membrane such as polybenzimidazole. Therefore, PA loss during the operation of HT-PEMFCs causes the degradation of fuel cell performance. Nevertheless, the researches have been conducted so far to enlarge PA participating in the hopping mechanism in both electrode and membrane are limited to doping electrode and membrane with a certain amount of PA or applying proton-conducting organic compounds as monomers to polymerization of the membrane. In this study, small amounts of a proton-conducting additive are added to the electrode to improve its performance. The influence of additive content on the performance of the catalyst electrode was studied by changing in a range from 0.7 to 10 mg·cm-2. The result showed that a 6 mg·cm-2 of additive in the catalyst layer is optimum and the best performance is 0.66 V at 200 mA·cm-2.