

A novel Nafion-1,2,3 Triazole - H₃PO₄ composite membrane for non-humidity condition and high temperature PEMFC

Mun-Suk Jun and Je-Deok Kim

National Institute for Materials Science (NIMS), 1-1 Namiki, Tsukuba, Ibaraki, 305-0044, Japan

JUN.Munsuk@nims.go.jp, KIM.Jedeok@nims.go.jp

Abstract

The proton exchange membrane fuel cells (PEMFCs) are receiving increasing attention as one of the clean energy and suitable primary power sources for transportation and stationary applications. The proton exchange membrane of recent PEMFCs commonly is used perfluorosulfonic acid polymer membranes (e.g., Nafion). This polymeric membrane is dependent on the presence of water to solvate the protons from the sulfonic acid groups. Consequently, the operational cell temperature is limited to below 100°C. However, the PEMFC when operating at high temperature (above 120°C) is having numerous advantages because include increased reaction kinetics, easier water management and a better tolerance to CO.

In this study, we examined the development of Nafion-based composite membrane that can be used at high temperature and non-humidity condition. A novel Nafion-based composite membranes with 1,2,3-Triazole and phosphoric acid were prepared by autoclave solution processing [1]. And then, the Nafion-1,2,3-Triazole-H₃PO₄ (Na-Tri-PA) composite membranes were used as an electrolyte membrane for PEMFC at non-humidity condition of 150°C. We can be obtained homogeneous membrane by autoclave solution processing. And, the Na-Tri-PA composite membrane showed power density of about 20mW/cm² in single cell performance.

Acknowledgements

This work was partially supported by MEXT program for development of environmental technology using nanotechnology.

[1] J. -D. Kim, M. -S. Jun, C. Nishimura, Y. -W. Choi, ECS transactions, **35**, 241 (2011).