

Title: Novel polymer electrolyte membrane which proton conductive channel being constructed by Core-Shell type hybridized silica nanofillers

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Polymer Electrolyte Fuel Cell (PEFC) is promising energy generating system because of their high-energy conversion efficiency, low temperature operation, and compact cell design. We designed a novel polymer electrolyte membrane (PEM) for PEFC using inexpensive materials and fabricating precise nanostructures. We have focused on general inorganic filler filling method, which has advantage on improvement of heat resistance and gas barrier properties of the membrane. The structure of designed novel PEM composed of 2D oriented proton conductive polymer and spherical silica nanoparticles (NPs) were depicted in Figure 1. Our PEM consists of silica NPs with proton conductive polymer layer prepared by Reversible Addition-Fragmentation chain Transfer Polymerization with Particles (RAFT PwP)[1)] on its surface. RAFT PwP can prepare precisely adsorbed hydrophilic polymer layer on particles surface, 2D ion-conductive channel[2)] consist of weak acids can be effectively prepared. As a primary examination, proton conductive polymer was selected as inexpensive polymers with easy handling to examine our model[3)].

[1] Y. Nagao, J. Matsui et. al., *Langmuir* **29,** 6798 (2013).
[2] K. Shito et al., *Chem. lett*. **47**, 9 (2018).
[3] T. Arita, A. Masuhara, J. Matsui, K. Shito; Japanese Unexamined Patent Application Publication No. 2017-037762.

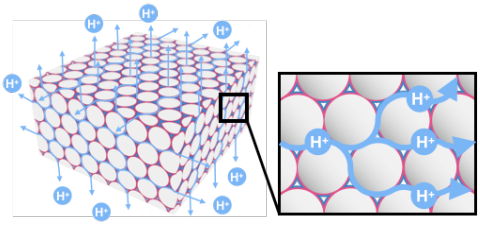


Figure 1. Image of the Core-Shell type hybridized silica nanofillers and PEM

Biography

Keiji Shito has completed his Master at the age of 24 years from Yamagata University and Ph.D. studies from Graduate School of Science and Engineering, Yamagata University. He has been serving as an Japan Society for the Promotion of Science (JSPS), Research Fellowship for Young Scientists DC2.

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