Remarkably Durable Polymer Electrolyte Fuel Cell Fabricated using Carbon Nanotube Composites

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Polybenzimidazole (PBI, Fig. 1) is known to show proton conduction after acid doping and recognized as a promising polyelectrolyte for high temperature polymer electrolyte fuel cell (HT-PEFC) because the PBI exhibits an excellent proton transfer even under dry condition at higher temperature over 100 °C.

We have reported PBI adsorbed onto the surface of carbon nanotubes (CNTs) and acts as the good dispersant of CNTs [1]. By taking the advantage of uniform wrapping of PBI on CNTs surface, we utilized this composite (CNT/PBI) as a novel carbon supporting materials for the loading of platinum (Pt) nanoparticles to fabricate an electrocatalyst for PEFC [2,3].

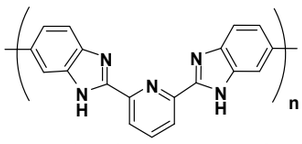

Fig. 1 Chemical structure of PBI

The catalyst shows excellent Pt utilization efficiency mainly due to the formation of ideal interfacial structure around Pt. We fabricated the PEFC membrane electrode assembly (MEA) using the obtained composite (CNT/PBI/Pt) after doped with acid, and measured the fuel cell performance using hydrogen and air as fuels [4]. At the meeting, we focuss on the durability of the MEA based on this CNT composites. Also, to reveal the advantage of the CNT-based electrocatalyst, we compare the durability of the MEA based on carbon black, which was fabricated in the same manner with that of the CNTs.

References

[1] T. Fujigaya et al. *Adv. Funct. Mater.* **2008**, 18, 1776.
[2] M. Okamoto et al. *Small* **2009**, 5, 735.
[3] T. Fujigaya et al. *Carbon* **2009**, 47, 3227.
[4] K. Matsumoto et al. *J. Mater. Chem*. **2011**, 21, 1187.