A Study of PBI and Mesoporous Inorganic Filler Composite Membranes for PEMFC Application

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To prepare polybenzimidazole (PBI) and mesoporous inorganic filler composite membranes for PEMFC (Polymer electrolyte membrane Fuel Cell), 3,3'-diaminobenzidine was synthesized with pyridine-2,5-dicarboxylic acid. Polyphosphoric acid was used as solvent. And also organic-inorganic composite membranes from PBI and mesoporous inorganic materials were synthesized. The mesoporous inorganic materials were containing specific metal ions. we changed Si/metal ratio of mesoporous inorganic materials. Composite membranes were doped with phosphoric acid (H3PO4).
The synthesis of 2,5-PBI was confirmed by a Fourier Transform Infrared Spectroscopy (FT-IR, DIGILAB Co.). We also investigated thermal stability using Thermal Gravimetric Analysis (TGA, TA instrument, Q-50) for the composite PBI membranes. The ion conductivity depending on the temperature was measured with an Impedance analyzer (Autolab Impedence Analyzer), and interpreted as a function of the acid content and the weight percent of porous inorganic materials.