Asymmetric Polymer Electrolyte Membranes for Water Management of Fuel Cells

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A polymer electrolyte membrane fuel cell (PEMFC) is an energy conversion device that generates electrical power from the chemical reaction occurring between hydrogen and oxygen, and has drawn a great deal of attention due to its sustainability and environmental benignity. One of the most important issues in PEMFC technology is water management during fuel cell operation, as membranes tend to dry at the anode and water floods the cathode, resulting in a drop of fuel cell performance. To overcome these problems, engineering techniques have primarily focused on controlling the system design and operating conditions. Although these engineering approaches have enhanced water management, they have also caused higher energy loss or require a complex management system.
In this study, we present the development of a novel asymmetric membrane based on a pore-filling method that uses an asymmetric porous substrate, and is capable of the water management described above. This membrane relieves problems associated with both humidification and water flooding, based on its controlled asymmetric structure.