

Preparation of Nafion/polystyrene composite membranes using supercritical CO₂
impregnation
for DMFCs

변정연, 석준호, 김화용*
서울대학교
(hwayongk@snu.ac.kr*)

Grafting of styrene onto Nafion membranes was carried out by the impregnation and radical polymerization in the supercritical carbon dioxide (scCO₂) as a solvent and swelling agent. In impregnation process, Certain amounts of CO₂ charged into the apparatus until desired pressure was reached. Styrene monomer and the initiator 2,2'-Azobisobutyronitrile (AIBN) were impregnated into Nafion membranes at 38°C for 4h. After releasing CO₂, the polymerization step then was started by raising the temperature 80°C and carried out at a pressure of 100bar for 4h. After grafting reaction, the grafted membranes have been sulfonated to various degrees in concentrated sulfuric acid (98% H₂SO₄) at room temperature. The grafted membranes were characterized by measuring their ion exchange capacities (IEC), ion conductivity and methanol permeation. The structure and morphology of these membranes were observed with FTIR and SEM. The N-g-pssa showed lower methanol permeability than that of Nafion 115. As the IEC and ion conductivity were increased, the cell performance was simultaneously increased. The grafted membranes(N-g-pssa) were tested as electrolytes in the DMFC station.