Performance Improvement of PEMFCs based on Short-Side-Chain PFSA Membrane

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Nafion membrane has several problems such as high cost, degradation at high temperature. The thermal stability of polymeric membranes with good proton conductivity is very critical issue for the development of high temperature PEMFCs.
We report on high performance polymer electrolyte membrane fuel cells (PEMFCs) that function at high temperature and low humidity conditions based on short-side-chain perfluorosulfonic acid (SSC-PFSA) membrane.
The PEMFCs fabricated with both SSC-PFSA membrane and ionomer exhibited higher performance than those with long-side-chain (LSC) PFSA at temperatures higher than 100℃. As a result, the SSC-PFSA cell delivered 2.43 times higher current density (0.524 A·cm-1) at a potential of 0.6 V than LSC-PFSA cell at 140 ℃ and 20 % relative humidity (RH). In addition, the degradation rate of LSC-PFSA membrane is larger than that of SSC-PFSA.