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Study of sealing materials for Proton Exchange Membrane Fuel Cell (PEMFC)

Cheng-Hong Liu
Industrial Technology Research Institute, Taiwan

Intrinsically, silicone-based polymer commonly used as sealing material is suitable for the proton exchange membrane fuel cell (PEMFC). However, sealing materials become unstable when fuel cells long-term operate at elevated temperature (60~80°C), high assembly forces (4~8 MPa) and in the presence of chemical reagent. As a result, leakage of the fuel cell stack occurs. The purpose of this study is to evaluate the elastic property of selected sealing materials under controllable parameters such as temperature, assembly forces, gas (H_2/Air), and chemical reagent. Results are beneficial for the selection of sealing materials for fuel cell stacks. Stress relaxation properties of elastic materials during long-term operation (>3,000 h) were also investigated. A sandwich-type single cell is used to measure the gas leakage behavior as a function of stress relaxation parameters of sealing materials during the long-term test under static temperature and assembly forces. By comparing different operation conditions, it shows that high compression of sealing materials can effectively extend cell operation with negligible gas leakage even at higher backpressure. The intrinsic degradation of sealing materials has been proven to be reduced when assembly forces increased.

Biography

Cheng-Hong Liu has his expertise in catalyst synthesis and stacks design in field of fuel cells, especially PEMFC. The representative research is about mass productive catalysts synthesis used for hydrogen generation from chemical hydride, published in Applied Catalysis B: Environmental (IF=8.328). So far, he works in developing PEMFC stacks with high power density as a Researcher in Industrial Technology Research Institute (ITRI), which is the representative R&D foundation in Taiwan.

ch_liu@itri.org.tw

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