Flexible Multiple Micro Sensor for Local Persistent Effect Test in High Temperature Proton Exchange Membrane Fuel Cell Stack

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The nonuniformity of local temperature, voltage and current in the high temperature proton exchange membrane fuel cell stack can accelerate the aging of membrane electrode assembly (MEA) and the failure of overall fuel cell stack. This study used micro-electro-mechanical systems (MEMS) technology to integrate micro temperature, voltage and current sensors into a 40µm thick stainless steel substrate, the flexible multiple micro sensor was embedded in the high temperature fuel cell stack for 100-hour persistent effect test at 150°C operating temperature and constant current 20A and real-time microscopic diagnosis of local information of internal temperature, voltage and current. The experimental results showed that the nonuniform temperature distribution in the high temperature fuel cell stack resulted in nonuniform voltage and current distributions and hot stack.

Keywords: High temperature proton exchange membrane fuel cell stack, MEMS, Flexible multiple micro sensor, 100-hour persistent effect test, real-time microscopic diagnosis.

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