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Proton-exchange-membrane fuel cells durability evaluated by load-on/off cycling

G.J.M. Janssen, E.F. Sitters, A. Pfrang

Abstract

Load-on/off cycles at 80 ˚C, with near-saturated H2 and air at ambient pressure were applied to investigate the durability of several types of membrane-electrode-assemblies (MEAs) for proton exchange-membrane fuel cells (PEMFC). The ohmic resistance, H_2 cross-over, electrochemically active surface area (ECSA), protonic resistance of the cathode as well as the performances with H_2/air and H_2/O_2 were measured at regular intervals. These data enabled a breakdown of the increase in cell voltage losses upon cycling. Increase of kinetic losses was found in all MEAs but significant differences were obtained for the transport losses in the cathode catalyst layer, which either had a small or a substantial contribution to the overall voltage decay, depending on the carbon type and ionomer loading. Membrane degradation did not contribute significantly in these tests.

Key Words

Proton-exchange-membrane fuel cell, cathode active layer, durability, transport properties, accelerated stress test.