Mathematical modeling of direct borohydride fuel cells and its experimental validation

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Abstract

Direct borohydride fuel cells (DBFCs) use sodium borohydride ($NaBH_4$) as fuel and hydrogen peroxide (H_2O_2) as an oxidant. A mathematical model encompassing mass balance of ionic species in different regions of the DBFC is developed. Both the oxidation of sodium borohydride and reduction of hydrogen peroxide are assumed to obey Tafel kinetics. This is combined with boundary conditions similar to experimental conditions. Mathematical software package COMSOL Multiphysics is used to solve the resulting set of coupled partial differential equations. The model is validated against experimental data for a DBFC for varying operating conditions.