

Test of Different Anode Electrocatalysts for Direct Glucose Anion Exchange Membrane Fuel Cell

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Direct glucose anion exchange membrane fuel cell (AEMFC) with near-neutral-state electrolyte of 0.1 M [PO₄]_{tot} was studied with five different anode electrocatalysts (Pt, PtRu, PtNi, Au, PdAu) at a temperature of 37 °C and at a glucose concentration of 0.1 M. The cathode catalyst in each test was Pt supported on carbon (60 wt.%). Four anode electrocatalysts (supported on carbon) had a total metal content of 40 wt.% while the fifth anode material of PtRu had a higher content of 60 wt.%. Moreover, in order to show the influence of the metallic content on the fuel cell performance, anode catalysts with 60 wt.% (Pt) and 10wt.% (PtNi) were tested. The operation of the AEMFC was controlled by means of an in-house-made electronic load with PI-controller (i.e. a feedback controller that has proportional and integral action on control error signal) either at constant current (CC) or at constant voltage (CV). The primary objective was to characterize the Coulombic efficiency (CE) based on the exchange of two electrons and compare the specific energy (Wh kg⁻¹) for the direct glucose AEMFC related to the different electrode combinations and electrocatalysts. As a result of these screening tests, two most efficient anode electrodes with Pt and PtNi were selected to be used for further AEMFC studies.

Keywords: glucose, anode electrocatalysts, anion exchange membrane fuel cell, near-neutral-state electrolyte

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