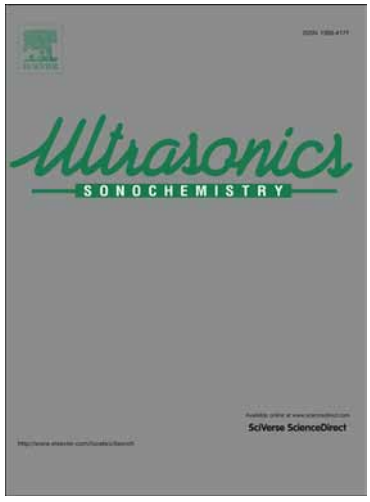

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Studies on an ultrasonic atomization feed direct methanol fuel cell

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Abstract: Direct methanol fuel cell (DMFC) is promising as an energy conversion device for the replacement of conventional chemical cell in future, owing to its convenient fuel storage, high energy density and low working temperature. The development of DMFC technology is currently limited by catalyst poison and methanol crossover. To alleviate the methanol crossover, a novel fuel supply system based on ultrasonic atomization is proposed. Experimental investigations on this fuel supply system to evaluate methanol permeation rates, open circuit voltages (OCVs) and polarization curves under a series of conditions have been carried out and reported in this paper. In comparison with the traditional liquid feed DMFC system, it can be found that the methanol crossover under the ultrasonic atomization feed system was significantly reduced because the DMFC reaches a large stable OCV value. Moreover, the polarization performance does not vary significantly with the liquid feed style. Therefore, the cell fed by ultrasonic atomization can be operated with a high concentration methanol to improve the energy density of DMFC. Under the supply condition of relatively high concentration methanol such as 4M and 8M, the maximum power density fed by ultrasonic atomization is higher than liquid by 6.05% and 12.94% respectively.

Keywords: ultrasonic atomization; methanol crossover; direct methanol fuel cell; open circuit voltage; polarization performance

1. Introduction

The direct methanol fuel cell (DMFC) is an electrochemical device using methanol as

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