Current Status of and Recent Developments in Direct Liquid Fuel Cells

J. Mergel, A. Glüsen, C. Wannek

This document appeared in

Detlef Stolten, Thomas Grube (Eds.):
18th World Hydrogen Energy Conference 2010 - WHEC 2010
Parallel Sessions Book 1: Fuel Cell Basics / Fuel Infrastructures
Proceedings of the WHEC, May 16.-21. 2010, Essen
Schriften des Forschungszentrums Jülich / Energy & Environment, Vol. 78-1
Institute of Energy Research - Fuel Cells (IEF-3)
Forschungszentrum Jülich GmbH, Zentralbibliothek, Verlag, 2010
ISBN: 978-3-89336-651-4

Current Status of and Recent Developments in Direct Liquid Fuel Cells

Jürgen Mergel, Andreas Glüsen, and Christoph Wannek

Abstract

Direct liquid fuel cells, such as the direct methanol fuel cell (DMFC) or the direct ethanol fuel cell (DEFC), convert liquid fuel directly into electric current. In comparison to fuel cell systems that operate with pure hydrogen or hydrogen-rich gases from reforming processes, the fuel in the DMFC is supplied directly via liquid methanol. Apart from the very high energy density of methanol, the DMFC is characterized by easy handling and trouble-free refueling. As the reforming step is by-passed in direct fuel cells, compensation in the form of higher overvoltages (i.e. electrochemical losses) is acceptable. Despite the resulting moderate power densities, direct fuel cells are more attractive for a variety of applications in the low to medium power range than PEM fuel cells powered by hydrogen. Examples of their use include replacement of batteries in portable applications and for light traction, as there is no need for the relatively expensive and time-consuming charging of batteries or for a spare battery for multipleshift operation. Furthermore, the high energy density of the liquid energy carrier permits much longer operating times than batteries or fuel cell systems based on hydrogen. This paper outlines the level of development of different direct liquid fuel cells based on current research findings and trends.