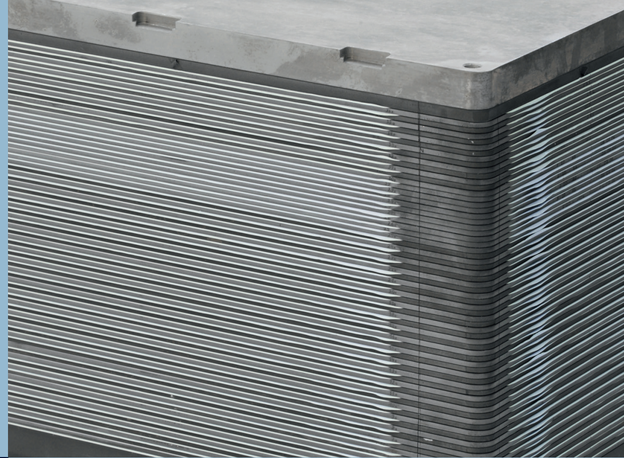
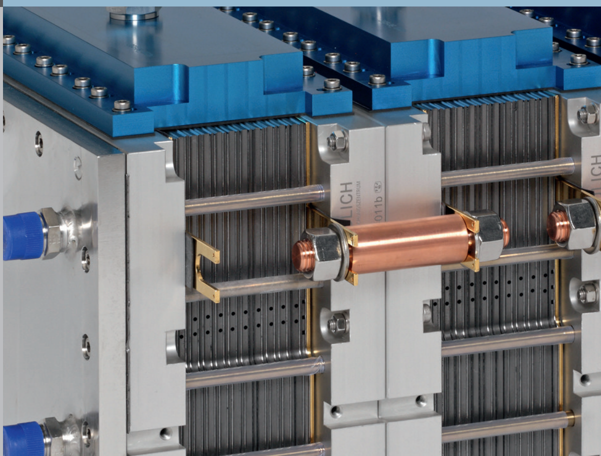




IEK-3 Report 2011

Climate-Relevant Energy Research

Member of the Helmholtz Association

JÜLICH
FORSCHUNGSZENTRUM

Forschungszentrum Jülich GmbH
Institute of Energiy and Climate Research (IEK)
Electrochemical Process Engineering (IEK-3)

IEK-3 Report 2011

Climate-Relevant Energy Research

Schriften des Forschungszentrums Jülich
Reihe Energie & Umwelt / Energy & Environment Band / Volume 149

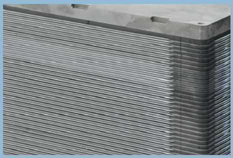
ISSN 1866-1793 ISBN 978-3-89336-809-9

Institute of Energy and Climate Research – Fuel Cells (IEK-3)

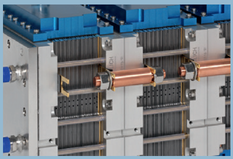
IEK-3 is one of nine sub-institutes within the Institute of Energy and Climate Research at Forschungszentrum Jülich GmbH. IEK-3 aims to conduct research of social, ecological and economic relevance and thus generate groundbreaking results on an international level. This quality of work is achieved through basic research in close coordination with technical development work in relevant scientific and technical fields of expertise. Special significance is attached here to international cooperations with partners from research and industry.

By implementing research results in innovative products, procedures and processes in cooperation with industry, IEK-3 hopes to help bridge the gap between science and technology. Cooperation with universities, universities of applied sciences, training departments and training centers is designed to promote opportunities for further education and training.

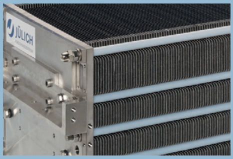
With a staff of approximately 100, IEK-3 concentrates on the basic topics of electrochemistry and process engineering for fuel cells. In an integrated approach, the four key areas worked on in the institute – direct methanol fuel cells, high-temperature polymer electrolyte fuel cells, solid oxide fuel cells and fuel processing systems – are accompanied by systems analysis and theoretical investigations, basic modeling and simulations, and by experimental and theoretical systems evaluations. The information generated in these areas is used to design and verify functional systems. In addition, particular attention is given to the development, configuration and application of special measuring techniques for the structural analysis of membrane electrode assemblies, for flow simulation and visualization, and for the characterization of stacks.



The solid oxide fuel cell (SOFC) stack pictured comprises 36 cells, each with an active cell area of 360 cm². The nominal power at a mean cell voltage of 800 mV is approximately 5.5 kW. The stack is operated on natural gas, which is directly reformed on the anode to hydrogen and CO.



The high-temperature polymer electrolyte fuel cell (HT-PEFC) stack pictured comprises a total of 30 cells. With an active cell area of 320 cm², the maximum electric power is approximately 2 kW. Two distinctive features are the modular construction and the split bipolar design with integrated temperature control.



The direct-methanol fuel cell (DMFC) stack pictured is part of a hybrid system that will replace batteries in the light traction sector. The nominal electric power is 1.3 kW (peak: 3 kW). The stack comprises 90 cells, each with an active area of 315 cm². The bipolar plates are made of expanded graphite. The cathodic pressure loss is less than 2 mbar, thus allowing the use of an air compressor to supply air.

Energie & Umwelt / Energy & Environment
Band / Volume 149
ISBN 978-3-89336-809-9

JÜLICH
FORSCHUNGSZENTRUM