Pressurized Operation of a Planar Solid Oxide Cell Stack - DTU Orbit (08/11/2017)

Pressurized Operation of a Planar Solid Oxide Cell Stack

Solid oxide cells (SOCs) can be operated either as fuel cells (SOFC) to convert fuels to electricity or as electrolyzers (SOEC) to convert electricity to fuels such as hydrogen or methane. Pressurized operation of SOCs provide several benefits on both cell and system level. If successfully matured, pressurized SOEC based electrolyzers can become more efficient both energy- and cost-wise than PEM and Alkaline systems. Pressurization of SOFCs can significantly increase the cell power density and reduce the size of auxiliary components. In the present study, a SOC stack was successfully operated at pressures up to 25 bar. The pressure dependency of the measured current-voltage (I-V) curves and impedance spectra on the SOC stack are analyzed and the relation between various system parameters and pressure is derived. With increasing pressure the open circuit voltage (OCV) and the reaction kinetics (electrode performance) increases for thermodynamic and kinetic reasons, respectively. Further, the summit frequency of the gas concentration impedance arc and the pressure difference across the stack and heat exchangers is seen to decrease with increasing pressure following a power-law expression. Finally a durability test was conducted at 10 bar.

General information

State: Published
Organisations: Department of Energy Conversion and Storage, Applied Electrochemistry, Mixed Conductors
Authors: Jensen, S. H. (Intern), Sun, X. (Intern), Ebbesen, S. D. (Intern), Chen, M. (Intern)
Number of pages: 14
Pages: 205–218
Publication date: 2016
Main Research Area: Technical/natural sciences

Publication information

Journal: Fuel Cells
Volume: 16
Issue number: 2
ISSN (Print): 1615-6846
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.79 SJR 0.498 SNIP 0.62
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.699 SNIP 0.787 CiteScore 2.02
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.629 SNIP 0.816 CiteScore 2.05
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.841 SNIP 0.848 CiteScore 1.99
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.25 SNIP 1.008 CiteScore 2.76
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.656 SNIP 1.238 CiteScore 3.31
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.632 SNIP 1.243
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.368 SNIP 1.12
Web of Science (2009): Indexed yes

BFI (2008): BFI-level 1
Scopus rating (2008): SJR 1.523 SNIP 1.226
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.349 SNIP 1.086
Scopus rating (2006): SJR 1.194 SNIP 1.228
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.45 SNIP 0.501
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.232 SNIP 0.215
Web of Science (2004): Indexed yes
Web of Science (2001): Indexed yes
Original language: English
Durability, Electrochemical Impedance Spectroscopy, I-V curves, Planar, Pressure, Solid Oxide Cell, Stack, Electrochemical impedance spectroscopy
Electronic versions:
presurized.pdf. Embargo ended: 12/02/2017
DOIs:
10.1002/fuce.201500180
Source: FindIt
Source-ID: 2292082853
Publication: Research - peer-review › Journal article – Annual report year: 2016