Kinetic Studies on Ni-YSZ Composite Electrodes - DTU Orbit (09/11/2017)

Kinetic Studies on Ni-YSZ Composite Electrodes

AC and DC techniques were applied to investigate the electrochemical reaction kinetics of porous composite Ni/8-mol% yttria-stabilized zirconia (Ni/8YSZ) solid oxide cell (SOC) electrodes using a novel pseudo-3-electrode cell geometry. From OCV impedance spectra an activation energy Ea of 1.13 eV, prefactor yan of 3.7·105·T, hydrogen and steam partial pressure dependencies a and b respectively of -0.07 and 0.22 were determined. DC current density vs. overpotential curves compared with those predicted using the determined kinetic parameters. Apparent Butler-Volmer charge transfer coefficients α were determined from the current density vs. overpotential curves. Values ranging from 0.57 at 650°C to 0.64 at 850°C were determined from the anodic branch and 0.85 to 0.81 from the cathodic branch in the same range, with higher fitting accuracy in the anodic branch. The lower fitting accuracy of the cathodic branch and the need for different α values for each branch suggests that a simple BV model of the measured electrode kinetics is insufficient and/or different reaction mechanisms might be occurring in anodic vs cathodic polarization.

General information

State: Published
Organisations: Applied Electrochemistry, Department of Energy Conversion and Storage, Ceramic Engineering & Science
Authors: Njodzefon, J. (Intern), Sudireddy, B. R. (Intern), Hjelm, J. (Intern), Graves, C. R. (Intern)
Number of pages: 16
Pages: 1169-1184
Publication date: 2015
Conference: ECS Conference on Electrochemical Energy Conversion & Storage with SOFC–XIV, Glasgow, United Kingdom, 26/07/2015 - 26/07/2015
Main Research Area: Technical/natural sciences

Publication information

Journal: ECS Transactions
Volume: 68
Issue number: 1
ISSN (Print): 1938-5862
Ratings:
BFI (2017): BFI-level 1
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.4 SJR 0.231 SNIP 0.246
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.214 SNIP 0.257 CiteScore 0.36
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.214 SNIP 0.246 CiteScore 0.36
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.192 SNIP 0.237 CiteScore 0.27
ISI indexed (2013): ISI indexed no
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.24 SNIP 0.263 CiteScore 0.29
ISI indexed (2012): ISI indexed no
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.262 SNIP 0.284 CiteScore 0.36
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.247 SNIP 0.245
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.241 SNIP 0.266
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.253 SNIP 0.25
Scopus rating (2007): SJR 0.213 SNIP 0.206
Scopus rating (2006): SJR 0.135 SNIP 0.062
Original language: English
DOIs:
10.1149/06801.1169ecst
Publication: Research - peer-review › Conference article – Annual report year: 2016