Investigating phase behavior and structural changes in NiO/Ni-YSZ composite with monochromatic in-situ 2D and static 3D neutron imaging

In this work, we report neutron imaging studies of redox cycling of NiO/Ni-8YSZ (nickel/nickel oxide – yttria stabilized zirconia) composite used for electrodes in solid oxide electrochemical cells for efficient energy conversion (power-to-gas and vice versa) purposes (i.e. for anodes in solid oxide fuel cells, and for cathodes in solid oxide electrolysis cells). Results of in-situ 2D and ex-situ 3D measurements are presented. In-situ observation of phase transition between NiO and Ni were performed at the test Beamline for neutron Optics and other Applications (BOA) at the continuous neutron source SINQ of Paul Scherrer Institut (PSI, Switzerland) by means of monochromatic neutron imaging, and post mortem monochromatic neutron tomography was performed at Helmholtz Zentrum Berlin (HZB) at the BER II reactor using the CONRAD-2 imaging instrument. Combining both time resolved radiography and post mortem tomography provides complementary information about the reduction/oxidation degree and e.g. crack evolution in the investigated system and it is therefore possible to acquire information about the rate of chemical reactions and spatial evolution of phases and morphological features.

General information
State: Published
Organisations: Department of Energy Conversion and Storage, Mixed Conductors, Imaging and Structural Analysis, University of Bayreuth, Paul Scherrer Institute, Helmholtz–Zentrum Berlin für Materialien und Energie, Xnovo Technology ApS
Contributors: Makowska, M. G., Strobl, M., Kardjilov, N., Frandsen, H. L., Manke, I., Morgano, M., Lacatusu, M., De Angelis, S., Lauridsen, E. M., Kuhn, L. T.
Pages: 24-18
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Physica B: Condensed Matter
Volume: 551
ISSN (Print): 0921-4526
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 1.45 SJR 0.417 SNIP 0.791
Web of Science (2017): Impact factor 1.453
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.39 SJR 0.446 SNIP 0.828
Web of Science (2016): Impact factor 1.405
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.41 SJR 0.475 SNIP 0.809
Web of Science (2015): Impact factor 1.352
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 1.45 SJR 0.549 SNIP 0.931
Web of Science (2014): Impact factor 1.319
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 1.41 SJR 0.557 SNIP 0.99
Web of Science (2013): Impact factor 1.276
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 1.21 SJR 0.589 SNIP 0.887
Web of Science (2012): Impact factor 1.327
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1