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Solid State Ionics

Program Book

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Solid State Ionics

June 16(Sun)-21(Fri), 2019

PyeongChang Alpensia Resort, Korea

PROGRAM DETAILS

Poster Presentation

June 17(Mon)

Poster Number	Paper Title	Presenter	Organization
P-MON-203	Synchrotron-based operando near-ambient pressure spectroscopy studies of surfaces processes of perovskite-type electrodes for SOFC	Catalina E. Jimenez	Helmholtz-Zentrum Berlin
P-MON-204	Theoretical performance of SOFC with GDC electrolyte for methane fuel	Dae-Kwang Lim	KAIST
P-MON-205	New generation mesoporous oxygen electrode for solid oxide cell application	Federico Baiutti	IREC
P-MON-206	Biogas assisted electrolysis over LCTM anodes in an oxygen conducting solid oxide electrolysis cell	Ioannis Garagounis	Democritus Univ. Thrace
P-MON-207	Perovskite Fuel Electrodes with Exsolution of Ni Nanoparticlesfor Electrochemical Syngas Generation	Vasilis Kyriakou	DIFFER
P-MON-208	Characterization of ZrO_2-Y_2O_3-MnO_2 Solid Solutionsas Components for Reversible Solid Oxide Cells	Alejandro Natoli	Univ. Aveiro
P-MON-209	Pr doped $SrTiO_3$ decorated by ex-soluted Ni nanoparticles as potential candidate for SOFC/SOEC fuel electrode.	Bartosz Jerzy Kamecki	Gdańsk Univ. Tech.
P-MON-210	Evaluation of the Reversible Solid Oxide Cells using $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$ as an Air Electrode	Jaewoon Hong	Chonnam National Univ.
P-MON-211	Direct CO_2 electrolysis in solid oxide cells supported on a ceramic fuel electrode with straight open pores and coated catalys	Le Sun	USTC
P-MON-212	Synthesis and electrical conductivity in A-site doped Bi_4NbO_8Cl Sillén-Aurivillius Oxychlorides	Maksymilian Kluczny	Kyushu Univ.
P-MON-213	Detrimental phase evolution triggered by Ni in perovskite-type cathodes for CO_2 electroreduction	Shiqing Hu	Dalian Institute of Chemical Physics, CAS
P-MON-214	Copper-based Perovskite-type Oxides as an Efficient Air Electrode for rSOC	Anna Niemczyk	AGH Univ. Sci. Tech. Krakow
P-MON-215	Comparing the Microstructure of Solid Oxide Cells Tested as Fuel Cell and Electrolyzer	Martina Trini	TU Denmark
P-MON-216	Defect chemical influence on the activity of $La_{1-x}Sr_xMnO_3$ in oxygen evolution reaction	Raika Oppermann	Justus Liebig Univ. Giessen
P-MON-217	Molten Salt Synthesis of Porous $La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-\delta}$ as Efficient Anode Material toward Solid Oxide Electrolysis Cells	Ze Liu	Shanghai Institute of Applied Physics, CAS
P-MON-218	Efficient use of Rh via exsolution for application in automotive exhaust control	Dragos Neagu	Newcastle Univ.
P-MON-219	High Performance fabricated EDLC using Artocarpus heterophyllus starch derived N-rich hierarchically porous activated carbon and redox additive electrolyte	Kalaiselvan Ramakrishnan	Bharathiar Univ.
P-MON-220	Photocatalytic Oxygen Evolution Reaction Using n- and p-type Fe-doped Strontium Titanates	Shunta Ehara	Kyushu Univ.
P-MON-221	Preparation of Redox Additive-Improved Quasi-Solid-State Micro-Supercapacitor for Flexible Applications	Su Chan Lee	KIST/Yonsei Univ.
P-MON-222	Symmetry-Broken Atom Configurations at Grain Boundaries and Oxygen Evolution Electrocatalysis in Perovskite Oxides	Yoon Heo	KAIST
P-MON-223	Uncovering the Effects of Oxygen Defects on the Electrocatalytic Activity of Double Perovskite Oxides for Oxygen Evolution Reaction	Yunmin Zhu	South China Univ. Tech.

Characterization of ZrO_2-Y_2O_3-MnO_2 Solid Solutions as Components for Reversible Solid Oxide Cells

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Abstract

Long-term degradation remains the main issue for the viability of reversible solid oxide fuel/electrolysis cell (SOFC/SOEC) technology as practical hydrogen production and energy storage systems. While some lifetime-limiting factors are common in both regimes, the major specific degradation mechanism in SOEC regime relates to the delamination phenomena. The experimental and modelling results suggest that high oxygen pressures can develop in electrolyte near the anode/electrolyte interface resulting in formation of voids at the grain boundaries, intergranular fractures, cracks in anode, and anode delamination; all factors contribute to irreversible degradation. The objective of this work was the characterization of ZrO_2-Y_2O_3-MnO_2 solid solution in order to design a functional material with oxygen storage ability that may be used as inclusion into electrolyte membrane or as interlayer between electrolyte and oxygen electrode with the purpose of delay or prevent degradation and irreversible changes.
$((ZrO_2)_{1-x}(Y_2O_3)_x)_{1-y}(MnO_n)_y$ ceramics (x = 0.02-0.05, y = 0.05-0.15) were prepared by solid-state reaction route and sintered in air at 1400-1600°C. XRD results showed the formation of single-phase solid solutions with cubic fluorite-type structure for the compositions with x = 0.05, while the ceramics with lower yttria content comprised 2 or more phases based on different polymorphs of zirconia. The characterization of materials included microstructural studies (SEM/EDS), thermal analysis (thermogravimetry, dilatometry), measurements of electrical conductivity as function of temperature and oxygen partial pressure, and determination of ionic transference numbers by modified e.m.f. method. Increasing Mn content was found to results in increase of the total electrical conductivity and electronic contribution under oxidizing conditions, while ionic transport dominates under reduced oxygen partial pressures. Electrical measurements showed also a slow relaxation of electrical conductivity on redox cycling that possibly can be attributed to a variable solubility of Mn cations in fluorite lattice.

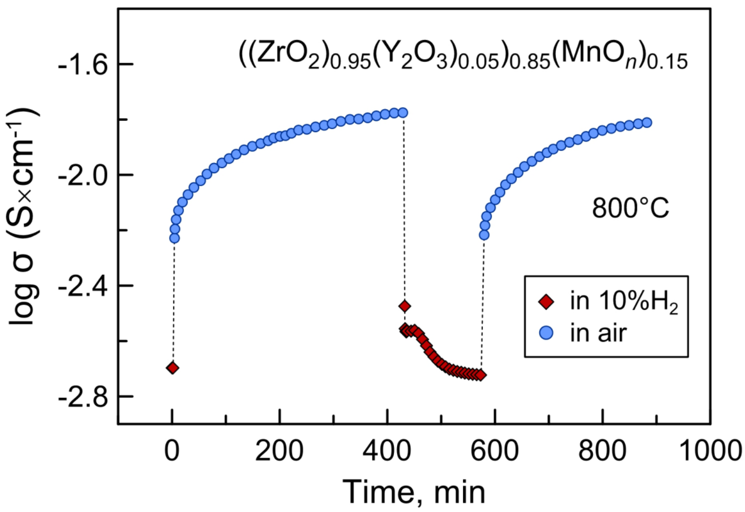

Fig.1. Relaxation of conductivity of $((ZrO_2)_{0.95}(Y_2O_3)_{0.05})_{0.85}(MnO_n)_{0.15}$ on redox cycling at 800°C.