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PROGRAM

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s03-008

Pei Kang Shen *(Collaborative Innovation Center of Sustainable Energy Mater, Guangxi University, Nanning, China)*, Shibin Yin

Noble Metal Free Materials as Efficient Catalysts for Water Splitting

s03-009

Thomas Turek *(Chemical and Electrochemical Process Engineering, Clausthal University of Technology, Clausthal-Zellerfeld, Germany)*, Matthias Koj

Novel alkaline water electrolysis process with nickel-iron gas diffusion electrodes for oxygen evolution

s03-010

Aleksey Yaremchenko *(Department of Materials and Ceramic Engineering, CICECO - Aveiro Institute of Materials, University of Aveiro, Aveiro, Portugal)*, Blanca Arias-Serrano, Ekaterina Kravchenko, Kiryl Zakharchuk, Jekabs Grins, Gunnar Svensson, Vladimir Pankov

Oxygen-Deficient Perovskite-Related $(Nd_{0.4}Sr_{0.6})_2Ni_{0.8}M_{0.2}O_4$-δ; as Oxygen Electrode Materials for SOFC/SOEC

Enzymatic fuel cell

s03-011

Kuan-Zong Fung *(Materials Science and Engineering, National Cheng Kung University, Tainan, Taiwan)*, Shu-Yi Tsai, Jhih-Yu Tang, Jaroslaw Milewski, Tomasz Wejrzanowski

Mixed-Conducting Mechanism for High-Temperature Fuel Cell Applications

Failure mechanisms

s03-012

Hassan Moydien *(Chemical Engineering, University of Cape Town, Cape Town, South Africa)*, Nabeel Hussain, Pieter Levecque

Testing Protocol for Reversal Tolerant Anodes under Cell Reversal by Simulated Fuel Starvation

Fuel Cell

s03-013

Nurudeen Adewumi Adebare *(Chemical Sciences, University of the Western Cape, Cape Town, South Africa)*, Lindiwe Khotseng, Akindeji Jerome Sabejeje

Investigation of Ternary Catalysts as Anode Catalysts for Direct Methanol Fuel Cells

s03-014

Wei Chen *(State Key Laboratory of Electroanalytical Chemistry, Changchun Institute of Applied Chemistry, CAS, Changchun, China)*, Cheng Du, Chunmei Zhang, Ruizhong Zhang, Xiaokun Li

Design and fabrication of porous carbonaceous electrocatalysts for the oxygen reduction reaction

s03-015

Felipe De Moura Souza *(Centro de Ciencias Naturais e Humanas, Universidade Federal do ABC, Santo Andre, Brazil)*, Paula Böhnstedt, Victor dos Santos Pinheiro, Luanna Silveira Parreira, Bruno Lemos Batista, Mauro Coelho dos Santos

Pd_1Nb_1 Electrocatalyst Supported on Printex 6L Carbon Black with Improvement Performance for ADEFC

s03-016

Oeznur Delikaya *(Institute of Chemistry and Biochemistry, Freie Universitaet Berlin, Berlin, Germany)*, Mohammad Zeyat, Konstantin Schutjajew, Dieter Lentz, Christina Roth

Pt nanoparticles on porous hollow electrospun carbon nanofibers as electrocatalysts for high temperature polymer electrolyte membrane fuel cell (HT-PEMFC) applications

s03-017

Katrin F. Domke *(Molecular Spectroscopy, MPI for Polymer Research, Mainz, Germany)*

The Correlation between Microscopic Pore Structure and Macroscopic Water and Ion Mobility in Fuel Cell Membranes

Oxygen-Deficient Perovskite-Related $(Nd_{0.4}Sr_{0.6})_2Ni_{0.8}M_{0.2}O_{4-\delta}$ as Oxygen Electrode Materials for SOFC/SOEC

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Perovskite-related $Ln_2NiO_{4+\delta}$ (Ln = La, Pr, Nd) nickelates with layered Ruddlesden-Popper combine redox stability with noticeable oxygen stoichiometry changes, yielding enhanced mixed transport and electrocatalytic properties. These unique features are promising for applications as oxygen electrodes with good electrochemical performance in reversible SOFC/SOEC (solid oxide fuel/electrolysis cell) systems. To date, most efforts were focused on oxygen-hyperstoichiometric $Ln_2NiO_{4+\delta}$-based phases, whereas nickelates with oxygen-deficient lattice remain poorly explored. Recent studies demonstrated that the highest electrical conductivity in $(Ln_{2-x}Sr_x)_2NiO_{4\pm\delta}$ series at elevated temperatures is observed for the compositions containing ~ 60 at.% of strontium in A sublattice [1,2]. The present work was focused on the characterization of $(Nd_{0.4}Sr_{0.6})_2Ni_{0.8}M_{0.2}O_{4-\delta}$ (M = Ni, Co, Fe) nickelates for the possible use as materials for reversible oxygen electrodes.

The ceramic materials were prepared by Pechini method with repeated annealings at 650-1200°C and sintered at 1250-1300°C for 5 h under oxygen atmosphere. Variable-temperature XRD studies confirmed that all studied compositions retain tetragonal K_2NiF_4-type structure in the temperature range 25-900°C. The results of thermogravimetric analysis showed that the prepared nickelates has oxygen-deficient lattice under oxidizing conditions at temperatures above 700°C. Partial substitution of nickel by cobalt or iron results in a decrease of *p*-type electronic conductivity and the concentration of oxygen vacancies in the lattice (Fig.1), but also suppresses dimensional changes associated with microcracking effects (due to anisotropic thermal expansion of tetragonal lattice). Electrochemical performance of porous $(Nd_{0.4}Sr_{0.6})_2Ni_{0.8}M_{0.2}O_{4-\delta}$ electrodes in contact with $Ce_{0.9}Gd_{0.1}O_{2-\delta}$ solid electrolyte was evaluated at 600-800°C employing electrochemical impedance spectroscopy and steady-state polarization (anodic and cathodic) measurements.

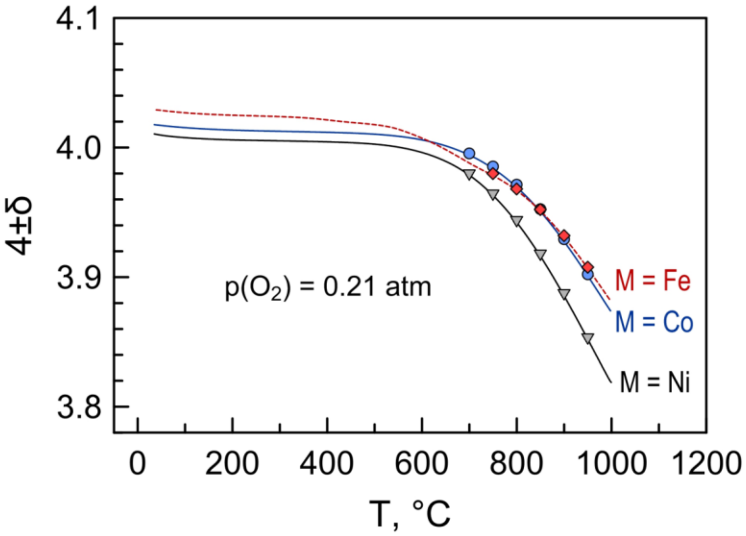

Figure 1. Oxygen nonstoichiometry of $(Nd_{0.4}Sr_{0.6})_2Ni_{0.8}M_{0.2}O_{4-\delta}$ in air. Lines correspond to the data obtained in dynamic cooling regime (2°C/min), and symbols correspond to the equilibrium values.

[1] E. Kravchenko, D. Khalyavin, K. Zakharchuk, J. Grins, G. Svensson, V. Pankov, A. Yaremchenko, J. Mater. Chem. A 3 (2015) 23852.

[2] E. Kravchenko, K. Zakharchuk, A. Viskup, J. Grins, G. Svensson, V. Pankov, A. Yaremchenko, ChemSusChem 10 (2017) 600.