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on Solid State Ionics

PROGRAM GUIDE

July 17-22, 2022

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BOSTON, MASSACHUSETTS



configuration of NiO-YSZ(support)|YSZ(electrolyte)|Anode. Although perovskite oxides are considered as promising candidates for Ni-based cermet cathode, the lack of highly stable and active cathodes still limit the development of SOECs. This report focuses on our group's research advances in recent years from several aspects, such as materials characteristics, cathode activation process, cathode construction strategies. We hope our efforts in this field are beneficial to the advancement of SOECs.

The relationship between properties of perovskite oxide and CO₂ electroreduction performance was investigated. We found the strength of metal-oxygen bond decides their phase stability under cathode polarization, and further influences performance. In addition, the performance of LaFeO₃ is enhanced due to the improvement in oxygen desorption and CO₂ adsorption abilities, increase of oxygen vacancy and the electron density of Fe site, but too much alkaline earth elements will lead to carbonate formation and degrade their activity and stability. Fe-based perovskite cathodes were activated via surface reconstruction with more generated oxygen vacancies and Fe nanoparticles. The electro-exsolved Fe nanoparticles are the major active site and tridentate carbonate species are considered as the transition species for CO₂ electroreduction. Therefore, the expected cathode should own a stable skeleton with strong metal-oxygen bond, active surface with metal nanoparticles and be free of carbonate formation. Metal nanoparticles were formed under cathode polarization.

Based on the design idea, novel 1/3 A-site deficient perovskite cathodes La_{0.66}Ti_{1-x}Fe_xO_{3-δ} (x=0.2, 0.3 and 0.4; LTF2, LTF3, LTF4) without doping alkaline earth elements were synthesized and tested. These cathodes show superior electrochemical performance with a low polarization resistance of 0.16 W cm² at 1.4 V and 800 °C for CO₂ electroreduction. LTF2 exhibits stable electrochemical performance over 300 h with the current density keeping above 0.5 A cm⁻² and Faradaic efficiency close to 100%. Surface reconstruction with the electrochemically exsolved iron nanoparticles under applied voltages was observed, and it shows high activity towards the CO₂ electroreduction.

Further, an alkaline earth elements free garnet oxide (Gd₃Fe₅O₁₂) was developed for CO₂ electroreduction, which can be converted into perovskite oxide and iron nano particles via *in situ* electrochemical phase transition during CO₂ electroreduction, resulting in high activity with Faradaic efficiency close to 100% and great stability over 1000 h galvanostatic test. A variety of experimental characterizations and density functional theory calculations indicate *in situ* exsolved Fe clusters effectively enhance the adsorption energies of intermediates and lowering the CO₂ dissociation barriers. Microkinetic modelling confirms that CO₂RR goes through a dissociative adsorption mechanism and the electronic transfer for CO₂ dissociation is the rate-determining step.

3:20 PM BREAK

4:00 PM EF17.05

Engineering the Surface of Ceria for CO₂ Reduction in High Temperature Solid Oxide Electrolysis Cells (SOECs) [Elena Marzia Sala](#)¹, Nicola Mazzanti¹, Francesco M. Chiabrera¹, Simone Sanna², Mogens Mogensen¹, Peter V. Hendriksen¹ and Christodoulos Chatzichristodoulou¹; ¹Danmarks Tekniske Universitet, Denmark; ²Universita degli Studi di Roma Tor Vergata, Italy

The electrochemical reduction of CO₂ in Solid Oxide Electrolysis Cells (SOECs) has the potential to alter the landscape of the chemical industry by conversion and storage of renewable energy in the form of hydrocarbons, gradually phasing out the production of chemicals from fossil sources. One of the biggest challenges associated with the large-scale commercialization of SOECs lies in improving the lifetime of the fuel electrode. The state-of-the-art Ni-YSZ composite cathode employed in SOECs nowadays suffers from various degradation mechanisms under operating conditions, such as carbon deposition, poisoning of the electrode surface by impurities present in the gas feed stream and Ni agglomeration/depletion from the electrode/electrolyte interface region¹. All these challenges can be alleviated with the introduction of doped ceria (CeO₂) as component of the fuel electrode. Ceria surfaces are less prone to carbon deposition, and more tolerant to impurities. Furthermore, the mixed ionic electronic conducting (MIEC) nature of ceria, under the reducing conditions of the cathode, extends the electrochemical reaction zone from the typical three-phase boundary (3PB), where YSZ, Ni, and gas phase meet, to a two-phase boundary (2PB) between ceria surface and the gas phase.

Recent research efforts highlight the promising perspective of ceria as single-phase technological fuel electrode². Accelerating this effort entails the optimization of the intrinsic electrocatalytic activity of ceria for CO₂ reduction, through the in-depth atomistic understanding of the underlying reaction mechanism and a systematic study of the levers that can modify the properties of ceria surfaces, by means of model systems with well-defined geometry, composition and surface area.

This work will offer an overview of our efforts investigating how the engineering of ceria surfaces influences its electrocatalytic activity towards CO₂ reduction. Two of the major strategies to tailor the properties of ceria surface consist of promoting a specific surface orientation and incorporating different type and amount of dopants in its fluorite structure. The presence of dopants at the surface and the surface termination have been shown to strongly influence the energy of oxygen vacancy formation and the reducibility of ceria, and to affect the reaction pathway through different types of reaction intermediates forming at the ceria/gas interface³. Dense thin film model electrodes of pure and doped ceria with well-defined surface orientation were produced by pulsed laser deposition and characterized under conditions relevant for SOECs by electrochemical impedance spectroscopy. Our work strives to reveal the role that these two levers play in the electrocatalytic activity of ceria and to unravel the energy landscape of the CO₂ reduction mechanism.

References

- 1 Mogensen, M. B., Chen, M., Frandsen, H. L., Graves, C., Hauch, A., Hendriksen, P. V., ... & Sun, X. (2021). Ni migration in solid oxide cell electrodes: Review and revised hypothesis. *Fuel Cells*, 21(5), 415-429.
- 2 Nanning, A., Holzmann, M., Fleig, J., & Opitz, A. K. (2021). Excellent kinetics of single-phase Gd-doped ceria fuel electrodes in solid oxide cells. *Materials Advances*, 2(16), 5422-5431.
- 3 Sala, E. M., Mazzanti, N., Mogensen, M. B., & Chatzichristodoulou, C. (2022). Current understanding of ceria surfaces for CO₂ reduction in SOECs and future prospects—A review. *Solid State Ionics*, 375, 115833.

4:15 PM EF17.06

Perovskite-Like Pr(A)MnO₃ (A = Ca, Sr) as Anode Materials for Solid Oxide Fuel-Assisted Electrolysis Cells [Aleksy Yaremchenko](#)¹, Dziyana Boiba¹, Mikhail Patrakeev², Aleksey Lisenkov¹, Aleksandr Bamburov¹ and Blanca I. Arias-Serrano^{1,3}; ¹University of Aveiro, Portugal; ²Institute of Solid State Chemistry UB RAS, Russian Federation; ³Leibniz Institute for Plasma Science and Technology, Germany

Long-term degradation remains the main issue for the viability of solid oxide electrolysis cell (SOEC) technology as a practical hydrogen production system. One of the main specific degradation mechanisms in SOECs relates to the delamination phenomena at or near the electrolyte/anode interface. The principle of so-called fuel-assisted electrolysis is to supply the carbon-containing species which can react with oxygen at the anode side thus bringing down the oxygen chemical potential at the electrolyte/anode interface and improving its stability. The present work is aimed at the characterization of PrMnO₃-based perovskites for potential application as anodes in solid oxide fuel-assisted electrolysis cells.

Pr_{0.60-x}A_{0.40}MnO_{3±δ} (A = Sr, Ca; x = 0 and 0.05) were synthesized by glycine-nitrate combustion technique. The characterization included XRD, SEM/EDS, XPS, dilatometry and thermogravimetry, measurements of electrical properties and oxygen permeability, and determination of oxygen nonstoichiometry. XRD analysis confirmed the formation of solid solutions with orthorhombic perovskite structure. The oxides exhibit negligible variations of oxygen content under oxidizing conditions while reducing p(O₂) below 10⁻⁴ atm results in oxygen losses from the lattice and reduction of Mn cations. XPS results

suggest that praseodymium remains in a 3+ oxidation state in the bulk of ceramics but may adopt a mixed 3+/4+ oxidation state at the surface. The low- $p(\text{O}_2)$ stability boundary of the perovskite phase at 800°C corresponds to $\sim 10^{-17}$ - 10^{-16} atm; the stability domain is wider for Ca-substituted compositions and narrows with the introduction of A-site vacancies. Dilatometric studies confirmed good thermomechanical compatibility with common solid electrolytes under oxidizing conditions; however, reduction at operation temperatures (800°C) leads to undesirable chemical expansion. The electrical conductivity of $\text{Pr}_{0.60-x}\text{A}_{0.40}\text{MnO}_{3\pm\delta}$ ceramics is p -type electronic and decreases with reducing $p(\text{O}_2)$ but still exceeds 40-50 S/cm under anticipated oxygen electrode operation conditions. The electrochemical activity of $\text{Pr}_{0.6-x}\text{A}_{0.4}\text{MnO}_{3\pm\delta}$ electrodes was evaluated in contact with yttria-stabilized zirconia solid electrolyte as a function of relevant parameters (fabrication conditions, with and without buffer layers, with modifications via infiltration of praseodymia and/or doped ceria). The best performance was obtained for the cells with $\text{Pr}_{0.55}\text{A}_{0.40}\text{MnO}_{3\pm\delta}$ electrodes (gadolinia-doped ceria buffer layers, PrO_y load of ~ 33 wt.%) that showed anodic overpotential of around 50 mV under 500 mA/cm² at 800°C in air.

4:30 PM EF17.08

Rapid Assessment and Optimization of Electrodes for Solid Oxide Fuel Cells and Electrolyzers Using Long-Term Performance Modeling and Machine Learning William K. Epting^{1,2}, Yinkai Lei^{1,2}, Jerry H. Mason^{1,2}, Thomas Kalapos^{1,2}, Gregory Hackett¹ and Harry W. Abernathy¹; ¹National Energy Technology Laboratory, United States; ²NETL Support Contractor, United States

A major impediment to the widespread commercialization of solid oxide cells (SOCs) for fuel cell and electrolysis usage is the long-term degradation in performance, much of which is driven by the complex 3D microstructure of the electrodes. The 3-phase electrode microstructures are highly heterogeneous, with variations occurring on length scales 2-3 orders of magnitude greater than the characteristic feature size, complicating many efforts to both characterize and model them. Previous works have found that electrode areas on the order of (100 μm)² must be collected to adequately measure the important microstructural parameters that dictate long-term performance [1] – volumes that call for esoteric and time-consuming techniques like Xe-plasma FIB-SEM tomography. The system is also of high dimensionality – even the somewhat simplified description employed in our approach [2] requires 11 independent initial parameters to specify an electrode's microstructure.

In this work, we present a comprehensive framework and toolset for rapid assessment and optimization of SOC electrode microstructures, accommodating both fuel cell and electrolysis operation. A machine learning model was trained on a bank of simulations of lifetime performance over 1,000 hours for hundreds of thousands of unique SOC electrode configurations, in fuel cell and electrolysis operation. The trained model can perform rapid prediction of lifetime cell performance. It can also produce tailored recommendations for improvement of these electrodes using SHAP analysis [3]. This approach has produced general recommendations as well – for example, that the LSM/YSZ or Ni/YSZ ratio is the most impactful parameter on long-term performance, with lower values tending to yield better performance.

To increase the utility of this trained model to cell developers, we have also developed a convolutional neural network (CNN) model that is able to predict microstructural properties from microstructural data with resolutions far coarser than the characteristic feature size. The predicted microstructural properties can then be used with the model described above to generate predictions of lifetime performance and tailored improvement recommendations, with coarse data generated with widely accessible and quick techniques such as microscale X-ray computed tomography. This allows cell developers and other stakeholders to evaluate their cells rapidly, either during development or as a form of quality control, using more widely accessible and rapid techniques such as microscale X-ray computed tomography.

References:

1. T. Hsu et al., J. Power Sources, 386, 1 (2018).
2. W. K. Epting et al., ECS Trans., 103, 909 (2021).
3. S. M. Lundberg, S-I. Lee. A Unified Approach to Interpreting Model Predictions. NIPS 2017.

4:45 PM EF17.09

Designing REBa_{0.5}Sr_{0.5}CoCuO_{5±δ} (RE: Selected Lanthanides, Y) Perovskites for the Anode-Supported Solid Oxide Fuel Cells Piotr Winiarz¹, Keyun Li¹, Kun Zheng¹, Muhammet E. Alagöz², Anna Niemezyk³, Ryszard Kluczewski⁴, Yevgeniy Naumovich³ and Konrad Swierczek¹; ¹Akademia Gorniczko-Hutnicza imienia Stanisława Staszica w Krakowie Wydział Energetyki i Paliw, Poland; ²Middle East Technical University, Turkey; ³Center for Hydrogen Technologies, Poland; ⁴Institute of Power Engineering, Poland

Cobaltite-based double perovskite REBaCo_{2-x}M_xO_{5±δ} (M: selected 3d elements) oxides are known for their high electrocatalytic activity and mixed ionic-electronic conductivity. These materials have been successfully applied to construct air electrodes in Solid Oxide Fuel Cells (SOFCs), replacing commonly used La_{1-x}Sr_xCo_{1-y}Fe_yO_{3±δ} simple perovskites. The dopant M in REBaCo_{2-x}M_xO_{5±δ} is usually Fe, Mn, or Ni, while substitution with Cu has not been yet studied in much detail for different RE cations and a wide concentration range. At the same time, it has been documented that partial replacement of Ba with Sr is possible, and the A-site layered double perovskite structure may be maintained even if Ba:Sr ratio is 1:1.

In this work, a comprehensive evaluation of the selected REBa_{0.5}Sr_{0.5}CoCuO_{5±δ} (RBSCCO) oxides is given, focusing on their phase composition and crystal structure, thermal expansion, oxygen content, chemical stability, and electrical conductivity. X-ray diffraction (XRD) was performed at room and high temperatures, with Rietveld analysis of the data. Apart from the XRD-derived unit cell expansion on temperature, dilatometry experiments were also conducted. The total oxygen content and its temperature change was evaluated on the basis of iodometric titration combined with thermogravimetric measurements. DC-4W electrical conductivity studies were performed in the air between RT and 900°C. Additionally, ab initio calculations were also done to investigate the energy of defects formation, using VASP and Medea software. General trends could be observed in the series, with smaller RE resulting in the decreased unit cell size, but also lowered oxygen content in the materials. Also, the formation of the layered structure was found to be hindered for larger RE cations, however, preparation of the material with Y substitution was also problematic. The electrical conductivity in the series was found to be adequate concerning the application. According to the expectations, doping with Cu enabled to decrease the thermal expansion, in comparison to Co-based reference samples. Overall, the results suggest that materials with RE = Pr, Nd, Sm, and Gd are the most interesting regarding the application in SOFCs. The chemical reactivity studies were conducted on the selected samples using the X-ray diffraction method. The investigated powders of RBSCCO materials were mixed together in a weight ratio of 1:1 with La_{0.8}Sr_{0.2}Ga_{0.8}Mg_{0.2}O_{3±δ} (LSGM) or Ce_{0.9}Gd_{0.1}O_{2±δ} (GDC10) electrolytes. After annealing at 900°C for 2 h in air, some additional peaks could be noticed in the RBSCCO:LSGM sample, indicating unwanted reactivity. However, good stability was observed in relation to GDC10, which was selected as a buffer layer in the further electrochemical studies.

Initial evaluation of the selected REBa_{0.5}Sr_{0.5}CoCuO_{5±δ} electrodes was performed on symmetrical cells consisting of 0.6 mm LSGM electrolyte pellet and GDC10 buffer layers screen-printed on both sides, sintered respectively at 1450°C for 8 h, and at 1350°C for 2 h. For the cathode slurries, fine powders of RBSCCO precursors were prepared by the sol-gel method and initially annealed in air at 900°C for 2 h, and then at 1000°C for 12 h. The screen-printed REBa_{0.5}Sr_{0.5}CoCuO_{5±δ} electrodes were sintered at 850 °C for 2 h in air. In general, the polarization resistances for the selected RBSCCO electrodes were found to be small, with the best values on the order of 0.02 $\Omega\cdot\text{cm}^2$ at 850°C, and 0.5 $\Omega\cdot\text{cm}^2$ at 600°C. This suggests possible application for SOFCs operating in the 600-800 °C range. Long-term stability tests were also conducted, e.g. for 120 h at 700°C, in which no significant increase of the polarization resistance was noticed. Finally, commercial-type anode-supported fuel cells based on the Ni-YSZ|YSZ support and the added GDC10 buffer were used with the RBSCCO cathodes. Notably, for the GdBa_{0.5}Sr_{0.5}CoCuO_{5±δ} electrode, the obtained power density at 625°C was measured to exceed 300

SYMPOSIUM DT

Defects and Transport Mechanisms in Solid Electrolytes and Mixed Conductors
July 18 - July 22, 2022

Symposium Organizers

George Harrington, Kyushu University / MIT
Rotraut Merkle, Max Planck Institute for Solid State Research
Alexander Opitz, Technische Universität Wien

* Invited Paper

SESSION DT25: Mixed Conductors II
Session Chair: James LeBeau
Thursday Afternoon, July 21, 2022
Mezzanine Level, Second Floor, Georgian

2:00 PM **DT25.01

***In Situ* Raman Spectroscopy—Novel Approaches to Study Oxygen Defect Dynamics in Mixed Conducting Oxides** Alexander Stangl¹, Adeel Riaz¹, Odette Chaix-Pluchery¹, Dolores Pla¹, Caroline Pirovano², Stefano Ambrosio¹, Federico Baiutti³, Albert Tarancón³, Carmen Jimenez¹, Michel Mermoux⁴ and Monica Burriel¹; ¹Laboratoire des Matériaux et du Génie Physique, France; ²Université de Lille, France; ³Institut de Recerca en Energia de Catalunya, Spain; ⁴Laboratoire d'Electrochimie et de Physico-chimie des Matériaux et des Interfaces, France

2:30 PM DT25.02

Selected Examples of High-Throughput Experimental Studies in Solid State Ionics and Solid State Electrochemistry Sossina Haile; Northwestern University, United States

2:45 PM *DT25.03

Simultaneous Electrical Impedance and Optical Absorption Measurements for Rapid Characterization of Defect and Transport Properties of Praseodymium Substituted Ceria Dmitri Kalaev and Harry Tuller; Massachusetts Institute of Technology, United States

3:05 PM DT25.04

Peculiarities of Ionic Conductivity Mechanisms in $\text{Bi}_{1-x}\text{Pr}_x\text{O}_{1.5}$ Rhombohedral System Jan Jamroz¹, Wojciech Wrobel¹, Marcin Krynski¹, Marcin Malys¹, Isaac Abrahams² and Franciszek Krok¹; ¹Politechnika Warszawska, Poland; ²Queen Mary University of London, United Kingdom

3:20 PM DT25.05

Novel Model-Building Tools for the Development of Near-Surface Mixed Ionic-Electronic Conducting Emulator Models for High-Temperature CO_2 Electrolysis Cells Alejandro Mejia^{1,2} and David S. Mebane¹; ¹West Virginia University, United States; ²Idaho National Laboratory, United States

SYMPOSIUM EF

Energy and Fuels Conversion
July 18 - July 22, 2022

Symposium Organizers

Sean Bishop, Sandia National Laboratories
Georgios Dimitrakopoulos, Massachusetts Institute of Technology

* Invited Paper

SESSION EF16: Proton Conducting Fuel Cells II
Session Chairs: Dong Ding and Jose M. Serra
Thursday Afternoon, July 21, 2022
Lobby Level, Avenue 34, Studio 2

2:00 PM EF16.01

Composite Effects on PCFC Cathodes Investigated by Utilizing Patterned Thin-Film Model Electrodes Zhuo Diao, Katsuya Nishidate, Takaaki Imaizumi, Yuta Kimura, Takashi Nakamura, Keiji Yashiro, Tatsuya Kawada and Koji Amezawa; Tohoku Daigaku, Japan

2:15 PM EF16.02

Fabrication of High Performance Tubular Protonic Ceramic Fuel Cells Youdong Kim, Charlie Meisel, Carolina Herradon, Jake Huang, Neal Sullivan and Ryan O'Hayre; Colorado School of Mines, United States

2:30 PM EF16.03

3D Printing of Electrodes for Proton Ceramic Electrochemical Cells—Recent Developments and Challenges Sebastian Wachowski¹, Malgorzata Nadolska¹, Mateusz Cieslik¹, Joanna Pospiech¹, Marek Chmielewski¹, Tomasz Sobczyk¹, Aleksandra Mielewczyk-Gryn¹, Maria Gazda¹, Jose M. Serra², Einar Vollestad³ and Ragnar Strandbakke⁴; ¹Politechnika Gdanska, Poland; ²Instituto de Tecnologia Quimica, Spain; ³SINTEF Industry, Norway; ⁴Universitetet i Oslo, Norway

2:45 PM EF16.04

Revitalizing Performance and Expanding Lifetime of Protonic Ceramic Cells by Interfacial Acid Etch Wenjuan Bian¹, Wei Wu¹, Meng Zhou², Congrui Jin³, Hanping Ding¹, Yanhao Dong⁴, Ju Li⁴ and Dong Ding¹; ¹Idaho National Laboratory Research Library, United States; ²New Mexico State University Board of Regents, United States; ³University of Nebraska, Lincoln, United States; ⁴Massachusetts Institute of Technology, United States

3:00 PM BREAK

SESSION EF17: Oxygen-Ion Conducting Electrolysis Cells II
Session Chairs: Georgios Dimitrakopoulos and Anne Hauch
Thursday Afternoon, July 21, 2022
Lobby Level, Avenue 34, Studio 1

2:00 PM **EF17.01

Emergent Nanomaterials for CO_2 Electrochemical Conversion John T. Irvine; University of St Andrews, United Kingdom

2:30 PM **EF17.02

Perspectives of Hydrogen and Syngas Production Using High Temperature Electrolyzers Olga A. Marina, Kerry Meinhardt, Dan Edwards and Jie Bao; Pacific Northwest National Laboratory, United States

3:00 PM *EF17.04

Solid Oxide Electrolysis Cells for CO₂ Electroreduction Weishen Yang; Chinese Academy of Sciences, China

3:20 PM BREAK

4:00 PM EF17.05

Engineering the Surface of Ceria for CO₂ Reduction in High Temperature Solid Oxide Electrolysis Cells (SOECs) Elena Marzia Sala¹, Nicola Mazzanti¹, Francesco M. Chiabrera¹, Simone Sanna², Mogens Mogensen¹, Peter V. Hendriksen¹ and Christodoulos Chatzichristodoulou¹; ¹Danmarks Tekniske Universitet, Denmark; ²Universita degli Studi di Roma Tor Vergata, Italy

4:15 PM EF17.06

Perovskite-Like Pr(A)MnO₃ (A = Ca, Sr) as Anode Materials for Solid Oxide Fuel-Assisted Electrolysis Cells Aleksey Yaremchenko¹, Dzyana Boiba¹, Mikhail Patrakev², Aleksey Lisenkov¹, Aleksandr Bamburov¹ and Blanca I. Arias-Serrano^{1,3}; ¹University of Aveiro, Portugal; ²Institute of Solid State Chemistry UB RAS, Russian Federation; ³Leibniz Institute for Plasma Science and Technology, Germany

4:30 PM EF17.08

Rapid Assessment and Optimization of Electrodes for Solid Oxide Fuel Cells and Electrolyzers Using Long-Term Performance Modeling and Machine Learning William K. Epting^{1,2}, Yinkai Lei^{1,2}, Jerry H. Mason^{1,2}, Thomas Kalapos^{1,2}, Gregory Hackett¹ and Harry W. Abernathy¹; ¹National Energy Technology Laboratory, United States; ²NETL Support Contractor, United States

4:45 PM EF17.09

Designing REBa_{0.5}Sr_{0.5}CoCuO_{5+δ} (RE: Selected Lanthanides, Y) Perovskites for the Anode-Supported Solid Oxide Fuel Cells Piotr Winiarz¹, Keyun Li¹, Kun Zheng¹, Muhammet E. Alagöz², Anna Niemczyk³, Ryszard Kluczewski⁴, Yevgeniy Naumovich³ and Konrad Swierczek¹; ¹Akademia Gorniczo-Hutnicza imienia Stanisława Staszica w Krakowie Wydział Energetyki i Paliw, Poland; ²Middle East Technical University, Turkey; ³Center for Hydrogen Technologies, Poland; ⁴Institute of Power Engineering, Poland

5:00 PM EF17.10

Phase-Field Modeling of Crack Growth and Mitigation in Solid Oxide Cells Fei Xue^{1,2}, Yinkai K. Lei^{1,2}, Tian-Le Cheng^{1,2}, William K. Epting^{1,2}, Gregory Hackett¹, Harry W. Abernathy¹ and You-Hai Wen¹; ¹National Energy Technology Laboratory, United States; ²NETL Support Contractor, United States

5:15 PM EF17.11

Ionic Conductivity of LaO₃F_{3-2x} Based Compounds in Air and H₂ Yatir Sadia^{1,2}, Inna Shusterman² and Brian Rosen³; ¹Ben Gurion University of the Negev, Israel; ²Nuclear Research Center of the Negev, Israel; ³Tel Aviv University, Israel

5:30 PM EF17.12

A Highly Robust and Reactive Metal-Oxide Nanocomposite Electrocatalyst for Facile Oxygen Reduction Reaction in Solid Oxide Fuel Cell Cathode SungHyun Jeon¹, Jongsu Seo¹, Jeonwoo Shin², Sung Je Lee², Han Gil Seo^{1,3}, Siwon Lee^{1,4}, Jinwook Kim¹, Nikolai Tsvetkov¹, Jihwan An² and WooChul Jung¹; ¹Korea Advanced Institute of Science and Technology, Korea (the Republic of); ²Seoul National University of Science and Technology, Korea (the Republic of); ³Massachusetts Institute of Technology, United States; ⁴University of Pennsylvania, United States

SYMPOSIUM EI

Electrochemical Interfaces
July 18 - July 22, 2022

Symposium Organizers

Koji Amezawa, Tohoku University
WooChul Jung, Korea Advanced Institute of Science and Technology
Jonathan Polfus, University of Oslo

* Invited Paper

SESSION EI12: Solid-State Batteries II
Session Chairs: Taro Hitosugi and Jongwoo Lim
Thursday Afternoon, July 21, 2022
Mezzanine Level, Second Floor, Berkeley/Clarendon

2:00 PM *EI12.02

Electron and Ion Transfer at Solid-Solid Interface—DFT-Based Electrochemistry with Explicit Interface Model Yoshitaka Tateyama; National Institute for Materials Science, Japan

2:20 PM EI12.03

In Operando Characterization of Interface Between Al doped Li₇La₃Zr₂O₁₂ Garnet Solid Electrolyte and LiNi_{0.6}Mn_{0.2}Co_{0.2}O₂ Cathode by Soft X-Ray Absorption Spectroscopy Younggyu Kim and Bilge Yildiz; Massachusetts Institute of Technology, United States

2:35 PM BREAK

3:00 PM **EI12.04

Thin-Film Solid-State Batteries with Epitaxial LiCoO₂ Films Kazunori Takada and Tsuyoshi Ohnishi; Busshitsu Zairyo Kenkyu Kiko, Japan

3:30 PM EI12.05

High Voltage Bipolar Stacking of Sulfide Based All Solid-State Batteries Hongli Zhu; Northeastern University, United States

3:45 PM EI12.06

Surface Tension of Melted Electrolytes at Nanostructural Cathode Interfaces and Their Effect on Lithium-Ion Transport Properties in Lithium-Metal Solid-State Batteries Abu Md Numan-Al-Mobin, Ian Kasten, Karen Ly, Greydon Shangreux and Alevtina Smirnova; South Dakota School of Mines and Technology, United States