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| Channel Diameter Effect of Porous Carbon Microparticles on PEMFC Performance for Highly Active Ultra-Low Pt Catalysts.....   | 1769 |
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| <i>Paulette A. Loichet, Yan-Sheng Li, Corbinian Grön, Timon Lazaridis, Christian H. Liebscher, Philipp Watermeyer, Hubert Andreas Gasteiger</i>  |      |
| Spatially Resolved Deconvolution of Loss Processes in PEM Fuel Cells.....  | 1776 |
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| Understanding the Effects of Different Engineered Carbon Supports (ECS) Supports on the Sintering Processes of Pt Nanoparticles ..... | 1785 |
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| Oxygen Reduction Reaction Catalyzed By Silicon and Nitrogen Co-Doped Carbon .....   | 1787 |
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| Nitric Oxide Probe Molecule Studies of Iron-Nitrogen-Carbon PEMFC Oxygen Reduction Reaction Electrocatalysts.....  | 1789 |
| <i>Deborah J. Myers, Magali Ferrandon, A. Jeremy Kropf, Piotr Zelenay, Hanguang Zhang, Esen E Alp, Jaehyung Park, Xiaoping Wang</i>                              |      |
| Optimization of Synthesis Variables Towards Improved Activity and Stability of Fe-N-C PGM-Free Catalysts .....   | 1791 |
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| A Systematic Investigation of Carbon Pretreatment for the Synthesis of Platinum Nano-Catalysts for Oxygen Reduction Reaction .....                               | 1793 |
| <i>Fabian Luca Buchauer, Lars Cleemann, Jens Oluf Jensen, Qingfeng Li, Benedikt Axel Brandes</i>   |      |
| Correlative Electrochemical-TEM Study: Probing the Pt Stability of Mesoporous N-Doped Carbon Supported Pt Nanoparticle ORR Electrocatalyst .....                 | 1795 |
| <i>Sven Küspert, Julia Melke, Haytham E. M. Hussein, Anna Fischer</i>  |      |
| Platinum-Based Nanoparticle Fuel Cell Catalysts Synthesized By Sputtering Onto Liquid Substrates .....   | 1797 |
| <i>Björn Lönn, Rosemary Brown, Robin Pfeiffer, Henrik Frederiksen, Björn Wickman</i>   |      |
| Synthesis of Platinum-Rare Earth Metal Alloy Catalysts for Proton Exchange Membrane Fuel Cells.....  | 1798 |
| <i>Quan Zhou, Yang Hu, Benedikt Axel Brandes, Lars Cleemann, Jens Oluf Jensen, Qingfeng Li</i>   |      |
| Recreating Fuel Cell Catalyst Degradation in Aqueous Environments for Identical-Location Scanning Transmission Electron Microscopy Studies.....                  | 1799 |
| <i>David A. Cullen, Haoran Yu, Michael J. Zachman, Chenzhao Li, Leiming Hu, Nancy N. Kariuki, Rangachary Mukundan, Jian Xie, K.C. Neyerlin, Deborah J. Myers</i> |      |
| Facile Solid-State Synthesis of Supported Pt <sub>m</sub> -Nps for the Oxygen Reduction Reaction .....   | 1801 |
| <i>Alexander Hopf, Jacopo De Bellis, Timo Imhof, Norbert Pfänder, Marc Ledendecker, Ferdi Schüth</i>   |      |
| Strain Evolution in Pt-Ni Alloy Nanoparticles during Electrochemical Ni Leaching Revealed By Bragg Coherent Diffraction Imaging.....                             | 1803 |
| <i>Tomoya Kawaguchi, Vladimir Komanicky, Vitalii Latyshev, Wonsuk Cha, Evan Maxey, Ross Harder, Tetsu Ichitsubo, Hoydoo You</i>                                  |      |

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| Determination of the $\tau/\varepsilon$ -Ratio for Gas Diffusion Substrates and Microporous Layers in an Operating Fuel Cell .....                                    | 1804 |
| <i>Anne Berger, Hubert Andreas Gasteiger</i>  |      |
| Towards Uncoated Stainless-Steel Bipolar Plates in Automotive PEM Fuel Cells .....  | 1806 |
| <i>Timon Novalin, Björn Eriksson, Sebastian Karl Proch, Ulf Bexell, Claire Moffatt, Jörgen Westlinder, Carina Lagergren, Göran Lindbergh, Rakel Wreland Lindström</i> |      |
| Investigation of IrO <sub>2</sub> Stability As a Cell-Reversal Mitigation Catalyst in PEMFC Anodes .....  | 1809 |
| <i>Ana Marija Damjanovia, Mohammad Fathi Tovini, Anna Freiberg, Jozsef Speder, Hany A. El-Sayed, Hubert Andreas Gasteiger</i>   |      |
| Grooved Electrodes to Enhance Mass Transport in Thick Platinum Group Metal-Free Fuel Cell Cathodes .....  | 1811 |
| <i>Luigi Osmieri, Tanvir Alam Arman, Siddharth Komini Babu, Jacob S. Spendelow</i>  |      |
| Effect of Catalyst Aggregate Size on the Mass Transport Properties of Non-Noble Metal Catalyst Layers in PEMFC Cathodes .....   | 1813 |
| <i>Secil Ünsal, Sofia Gialamoidou, Thomas J. Schmidt, Juan Herranz</i>  |      |
| Effect of Low and Sub-Freezing Temperature on the PEFC Performance of Unsupported Pt-Ni Aerogel Cathode Catalyst Layers .....   | 1815 |
| <i>Meriem Fikry, Pavel Khavlyuk, Juan Herranz, Alexander Eychmüller, Thomas J. Schmidt</i>  |      |

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| Shedding Light on Water Management during Operation of AEMFC with Humidity Sensors.....   | 1817 |
| <i>Björn Eriksson, Pietro Giovanni Santori, Nicolas Bibent, Frederic Lecoer, Marc Dupont, Frederic Jaouen</i>   |      |
| Atomically Dispersed Single Metal Sites for Promoting Pt and Pt <sub>3</sub> Co Catalysts in Heavy-Duty Meas .....  | 1819 |
| <i>Yachao Zeng, Qiao Zhi, Chenyu Wang, Chenzhao Li, Hui Xu, David A. Cullen, Deborah J. Myers, Jian Xie, Jacob S. Spendelow, Gang Wu</i>  |      |
| (Digital Presentation) Impact of the Cathode Catalyst Ink Solvent Composition on the Polymer Electrolyte Membrane Fuel Cell (PEMFC) Performance at High Current Densities ..... | 1820 |
| <i>Masuma Sultana Ripa, Ludwig Jörissen, Sylvain Brimaud</i>  |      |
| Durable and High-Power Iron-Based Cathodes for Proton-Exchange Membrane Fuel Cells .....  | 1822 |
| <i>Shengwen Liu, Chenzhao Li, Jian Xie, Shawn Litster, David A. Cullen, Michael J. Zachman, Deborah J. Myers, Gang Wu</i>   |      |
| Irreducible IrO <sub>2</sub> Anode Co-Catalysts for PEM Fuel Cell Voltage Reversal Mitigation and Their Stability Under Transient Operation Conditions .....                    | 1823 |
| <i>Mohammad Fathi Tovini, Ana Marija Damjanovic, Hany A. El-Sayed, Franziska Friedrich, Benjamin Strehle, Jozsef Speder, Alessandro Ghielmi, Hubert Andreas Gasteiger</i>       |      |
| (Digital Presentation) Investigation of Reversal Tolerant Anode Catalysts Ageing during Start-up/Shut-Down Events on a PEM Fuel Cell .....                                      | 1826 |
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| (Invited) Understanding the Electrocatalytic Mechanisms of Oxygen and Carbon Dioxide Reduction Reactions .....                                 | 1828 |
| <i>Di-Jia Liu</i>  |      |
| Surface Modification of Three-Dimensional Au Coated Polymer Electrodes for Electrochemical Reduction of CO <sub>2</sub> .....                  | 1829 |
| <i>Amirhossein Rakhsha, Fatma Ismail, Ahmed Abdellah, Leyla Soleymani, Drew Higgins</i>  |      |
| Hybrid Electrocatalysts Composed of PtSn, Ru or PtRu Nanoparticles for Low-Temperature Oxidation of Dimethyl Ether Fuel .....                  | 1831 |
| <i>Beata Rytelewska, Iwona A. Rutkowska, Pawel J. Kulesza</i>  |      |
| Deconvoluting Transport and Kinetics on Ionic Liquid-Modified Fe Catalysts for Oxygen Reduction .....  | 1833 |
| <i>Silvia Favero, Ifan Erfyl Lester Stephens, Magda Titirici</i>   |      |
| Electrochemical Trends of Atomically Dispersed Metal-Nitrogen-Carbon Materials As Oxygen Reduction Reaction Catalysts and Active Supports..... | 1837 |
| <i>Alvin Ly, Hanson Wang, Eamonn Murphy, Ying Huang, Shengyuan Guo, Yuanchao Liu, Iryna V. Zenyuk, Plamen Atanassov</i>                        |      |
| Understanding the Effect of Blending Ethanol with Formic Acid on Pd Activity Towards Acidic Oxidation of Concentrated Formic Acid.....         | 1839 |
| <i>Taher Al Najjar, Nashaat Ahmed, Ehab El Sawy</i>  |      |
| Highly Active TAL2 and TAL4 Metal-Organic Framework Derived Bifunctional Oxygen Electrocatalyst .....  | 1840 |
| <i>Gulnara Yusibova, Jurgen-Martin Assafrei, Jaan Aruväli, Maike Käärrik, Päärn Paiste, Jaan Leis, Pavel Starkov, Nadezda Kongi</i>            |      |
| Sacrificial Template-Assisted Mechanochemical Production of Highly Active Bifunctional Fe-N-C Catalysts .....                                  | 1841 |
| <i>Amina Alimbekova, Akmal Kosimov, Gulnara Yusibova, Jaan Aruväli, Maike Käärrik, Jaan Leis, Nadezda Kongi</i>                                |      |

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| (Digital Presentation) Power-Generation and Mass-Transport Characteristics of Direct Formic Acid Fuel Cell Using Pore-Designed Anode Electrode..... | 1842 |
| <i>Madiah Miskan, Takuya Tsujiguchi, Akio Kodama, Yugo Osaka</i>  |      |
| CO <sub>2</sub> Reduction to Formate By Efficient Bismuth Metal-Organic Framework (TAL33) Based Catalyst.....                                       | 1843 |
| <i>Jurgen-Martin Assafrei, Nadezda Kongi, Ritums Cepitis, Pavel Starkov, Mahboob Alam</i>   |      |
| The Understanding of the Improved Catalytic Performance of Steam-Activated Fe-N-C Catalyst for Alkaline Hydrazine Fuel Cell.....                    | 1844 |
| <i>Sooan Bae, Jihyeon Park, Beomgyun Jeong, Jaeyoung Lee</i>  |      |
| Transition Metal Doped Cannabis Catalysts for the Oxygen Reduction Reaction in Hydrogen Fuel Cells.....   | 1845 |
| <i>Zahra Imran Rana, Jingyu Feng, Emanuele Magliocca, Patricia McAlernon, Thomas Samuel Miller, Magda Titirici, Dan Brett</i>                       |      |

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| Synthesis of Nitrogen-Doped Wood-Based Carbon Materials and Their Application for Oxygen Reduction .....  | 1846 |
| <i>Loreta Tamasiunaite, Daina Upskuviene, Aldona Balciunaite, Vitalija Jasulaitiene, Gediminas Niaura, Audrius Drabavicius, Ance Plavniece, Aleksandrs Volperts, Galina Dobeles, Aivars Zhurins, Eugenijus Norkus</i> |      |
| How to Impede Hydrogen Evolution on Carbon Based Materials?.....  | 1847 |
| <i>Rose Patricia Oates, James Murawski, Carys Hor, Xuyang Shen, Daniel J Weber, Mehtap Oezaslan, Milo S P Shaffer, Ifan Erfyl Lester Stephens</i>   |      |
| MOF-Derived Fe-Zn-N-C Catalysts for Precious Metal Free Cathodes Showing High Performance in Anion-Exchange Membrane Fuel Cells.....  | 1849 |
| <i>Patrick Elsaesser, Philipp Veh, Severin Vierrath, Matthias Breitwieser, Anna Fischer</i>   |      |
| Bifunctional Platinum-Free Mixed Metal Oxygen Electrocatalysts Based on Naturally Abundant Peat .....   | 1851 |
| <i>Patrick Teppor, Rutha Jäger, Meelis Härmas, Jaan Aruväli, Olga Volobujeva, Miriam Koppel, Enn Lust</i>   |      |
| (Digital Presentation) Oxygen Reduction Reaction on Waste Tire Derived Carbon Material and Synthesized Non-Platinum Group Metal Catalysts in Alkaline Solution .....  | 1853 |
| <i>Joel Laanemäe, Rutha Jäger, Patrick Teppor, Olga Volobujeva, Enn Lust</i>  |      |
| The Interplay of Oxygen Reduction Reaction and Iron Dissolution from Fe-N-C Electrocatalysts.....   | 1855 |
| <i>YuPing Ku, Konrad Ehelebe, Markus Bierling, Florian Dominik Speck, Dominik Seeberger, Karl J. J. Mayrhofer, Simon Thiele, Serhiy Cherevko</i>  |      |
| Fe-N-C PGM-Free ORR Catalysts: An Investigation of the Source of Observed Redox Peaks and Their Significance to Catalysis.....  | 1857 |
| <i>Lynne LaRochelle Richard, Napachat Payakapan, Qingying Jia, Sanjeev Mukerjee</i>   |      |
| Toward a Fundamental Understanding of Strain Generation and Strain Tuning for the Fuel Cell Applications.....   | 1858 |
| <i>Zhenhua Zeng, Guangdong Liu, Arthur J Shih, Huiqiu Deng, Andrew Steinbach, Marc T. M. Koper, Jeffrey Greeley</i>   |      |
| Design of M-N-C Catalyst By Spray Pyrolysis and Pseudomorphic Transformation As Efficient Electrocatalysts for Oxygen Reduction Reaction .....  | 1859 |
| <i>Kyungmin Yim, Sung Jong Yoo, Jinsoo Kim</i>  |      |

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| Ionomer Dispersion for IrO <sub>2</sub> Based Oxygen Evolution Reaction Electrode with for Decal Process Application..... | 1860 |
| <i>Jong Hyeok Park, Beom-Seok Kim, Jin Soo Park</i>   |      |

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| (Digital Presentation) Temperature-Dependent Study for Hydrogen Permeability of a Polymer Electrolyte Membrane Used in a PEFC.....  | 1861 |
| <i>Manuel Celi, Jordy Santana, Mayken Espinoza Andaluz, Martin Andersson</i>  |      |
| Cobalt Nanoparticles Supported Graphitic Carbon Nitride Electrocatalyst for Oxygen Reduction.....   | 1863 |
| <i>Ausrine Zabielaite, Aldona Balciunaite, Daina Upskuviene, Jurate Vaiciuniene, Vitalija Jasulaitiene, Loreta Tamasauskaite-Tamasiunaite, Eugenijus Norkus</i>   |      |
| Synthesis and Characterization of Efficient Nitrogen-Doped Carbon Materials for Supercapacitors Application.....  | 1864 |
| <i>Eugenijus Norkus, Jolita Jablonskiene, Davyd Urbanas, Vitalija Jasulaitiene, Gediminas Niaura, Audrius Drabavicius, Ance Plavniece, Aleksandrs Volperts, Galina Dobeles, Aivars Zhurins, Loreta Tamasauskaite-Tamasiunaite</i> |      |
| Highly Stable Pt-Zn Intermetallic Oxygen Reduction Catalysts Supported on MOF-Derived Carbon for Proton Exchange Membrane Fuel Cells.....   | 1865 |
| <i>KwangHo Lee, Junu Bak, SangJae Lee, JeongHan Roh, EunAe Cho</i>  |      |
| Designing Highly Active Nanoporous Carbon Electrocatalysts for H <sub>2</sub> O <sub>2</sub> Production Via Active Site Elucidation.....  | 1866 |
| <i>June Sung Lim, Jae Hyung Kim, Jinwoo Woo, Du San Baek, Young Jin Sa, Sang Hoon Joo</i>   |      |
| Investigation of Oxygen Reduction on Platinum Nanoparticles Deposited Onto Peat-Derived Carbon Carrier.....   | 1867 |
| <i>Wiljar Lobjakas, Jaak Nerut, Heili Kasuk, Anu Adamson, Thomas Thomberg, Jaan Aruväli, Peeter Valk, Patrick Teppor, Miriam Koppel, Valdek Mikli, Olga Volobujeva, Enn Lust</i>  |      |
| The Influence of Pre-Irradiation and Simultaneous Grafting Methods on the Physicochemical Properties of Polyethylene-Based Anion-Exchange Membranes and Ionomers.....   | 1869 |
| <i>Ana Laura Gonçalves Biancolli, Andrey Silva Barbosa, Yasko Kodama, José Fernando Queiruga Rey, Fabio Coral Fonseca, Elisabete Inacio Santiago</i>  |      |
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| <i>Jong Hyeok Park, Beom-Seok Kim, Jin Soo Park</i>   |      |
| Catalyst Layers Prepared By Mixing Ionomer Dispersions with Different Equivalent Weights in Proton Exchange Membrane Fuel Cells.....  | 1872 |
| <i>Jong Hyeok Park, Beom-Seok Kim, Jin Soo Park</i>   |      |
| (Digital Presentation) Carbon Aerogel Platinum-Praseodymium Oxide Nanocatalyst for Methanol Oxidation in 0.5 M Sulfuric Acid.....   | 1873 |
| <i>Alise-Valentine Prits, Jaak Nerut, Heili Kasuk, Mihkel Koel, Silver Sepp, Peeter Valk, Jaan Aruväli, Miriam Koppel, Valdek Mikli, Olga Volobujeva, Enn Lust</i>  |      |
| Performance Prediction of Alkaline Fuel Cell Via Gradient Boosting Algorithm.....   | 1875 |
| <i>Jihyeon Park, Jaeyoung Lee</i>   |      |
| Characterisation of Novel Nitrogen Doped Reduced Graphene Oxide.....  | 1876 |
| <i>Jaak Nerut, Patrick Teppor, Rasmus Palm, Rutha Jäger, Thomas Thomberg, Kenneth Tuul, Miriam Koppel, Jaan Aruväli, Arvo Kikas, Jay Mondal, Valentino Iakimov, Enn Lust</i>  |      |
| (Digital Presentation) Temperature-Dependent Study for Electrochemical Surface Area on a Catalyst Layer Used in a PEFC.....   | 1877 |
| <i>R. Espinoza, Kevin Munoz, Jordy Santana, Mayken Espinoza Andaluz, Martin Andersson</i>   |      |
| (Digital Presentation) ORR/OER Activity and Rechargeable Zinc-Air Battery Performance of B Site Doped Double Perovskite NdBaCoXO <sub>5+δ</sub> (X= Fe, Ni, Mn).....  | 1879 |
| <i>Çağla Özgür, Cigdem Toparli</i>  |      |
| A Feasibility Study of Placing a Heated Turbulence Grid in Front of an Air-Cooled Fuel Cell Stack in Freezing Conditions.....   | 1880 |
| <i>Diogo Martinho, Jóhannes Hansen, Chunggen Yin, Torsten Berning</i>   |      |
| LiNO <sub>3</sub> -Based Polymer Electrolytes for Solid Electrochemical Capacitors.....   | 1884 |
| <i>Alvin Virya, Julian Rosas, Jobey Chua, Keryn Lian</i>  |      |

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|--|------|
| Functionalized and Chemically Exfoliated Molybdenum Oxide Nanosheets As Hybrid Electrodes for High Energy Density Supercapacitors .....                                  | 1886 |
| <i>Dalia Elgendy, Nageh K. Allam, Ehab El Sawy</i>   |      |
| CO <sub>2</sub> Turned into a Nitrogen Doped Carbon Catalyst for the Fuel Cell and Metal-Air Battery Applications.....   | 1887 |
| <i>Sander Ratso, Peter Robert Walke, Valdek Mikli, Jānis Ločs, Krišjānis Šmits, Virgīnija Vītola, Andris Sutka, Ivar Kruusenberg</i>                                     |      |
| (Digital Presentation) La <sub>0.8</sub> Sr <sub>0.2</sub> MnO <sub>3-Δ</sub> -Based Nanocomposite Functional Layers for Improved Cathode Efficiency in SOFCs.....       | 1889 |
| <i>Leire Caizan Juanarena, Javier Zamudio, Jose Manuel Porras-Vázquez, Enrique R. Losilla, David Marrero-Lopez</i>   |      |
| (Digital Presentation) Tuning Oxygen Reduction on Monoclinic and Tetragonal Zirconia Surfaces Using Oxygen Vacancy and Nitrogen Doping: A Density-Functional Study ..... | 1891 |
| <i>Shibghatullah Muhammady, Jun Haruyama, Shusuke Kasamatsu, Osamu Sugino</i>  |      |
| (Digital Presentation) Corrosion Behavior of Aluminum-Carbon Composite Bipolar Plates in Polymer Electrolyte Membrane Fuel Cells.....                                    | 1892 |
| <i>Aklima Jahan, Md. Ashrafal Alam, Sekai Yonezawa, Eiichi Suzuki, Hitoshi Yashiro</i>   |      |
| (Digital Presentation) Durable Silica Nanosheets/Carbon Black Supported Catalyst for Proton Exchange Membrane Fuel Cells.....  | 1894 |
| <i>Zunmin Guo, Ziyu Zhao, Zhaoqi Ji, Jianuo Chen, Maria Perez-Page, Stuart Holmes</i>  |      |
| (Digital Presentation) Large-Scale High-Performance Low Catalyst Loaded Membrane Electrode Assemblies for Advanced Proton Exchange Membrane Water Electrolyzers .....    | 1896 |
| <i>Zhiqiao Zeng, Stoyan Bliznakov, Leonard J. Bonville, Ryan J. Ouimet, Allison Niedzwiecki, Christopher Capuano, Katherine E. Ayers, Radenka Maric</i>                  |      |

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| Transition Metal and Nitrogen-Doped Mesoporous Carbons As Cathode Catalysts for Anion-Exchange Membrane Fuel Cells.....   | 1898 |
| <i>Jaana Lilloja, Elo Kibena-Pöldsepp, Ave Sarapuu, Maike Käärrik, Jekaterina Kozlova, Päärm Paiste, Arvo Kikas, Alexey Treshchalov, Jaan Leis, Aile Tamm, Vambola Kisand, Steven Holdcroft, Kaido Tammeveski</i> |      |
| Metal Fluoride Particles to Enhance Durability of Composite Membranes at MT-PEM Fuel Cell Operating Temperatures .....  | 1900 |
| <i>Maximilian Kutter, Annika Hilgert, Wiebke Hagemeier, Andreas Rosin, Thorsten Gerdes, Christina Roth</i>  |      |
| 3D Structured Pt(Cu-Ni)/Ti Catalysts for the Oxidation of Sodium Borohydride.....   | 1901 |
| <i>Aldona Balciunaite, Žana Činčienė, Loreta Tamasiunaite, Jūratė Vaičiūnienė, Eugenijus Norkus</i>   |      |
| Mathematical Model of Hydrogen Peroxide Production in Anode, Cathode, and Membrane of LT-PEMFC.....   | 1902 |
| <i>Ambroz Kregar, Andraž Kravos, Tomaž Katrašnik</i>  |      |
| Transformation of the Active Moiety in Fe-N-C Electrocatalyst through Invasive P-Doping for Highly Efficient Oxygen Reduction Reaction.....   | 1904 |
| <i>JeongHan Roh, Ara Cho, Sungjun Kim, Kug-Seung Lee, Jaewook Shin, Junu Bak, SangJae Lee, DongHoon Song, Eom-Ji Kim, Yong-Hun Cho, Jeong Woo Han, EunAe Cho</i>  |      |
| Single-Layer-Graphene and Electrochemical Exfoliated Graphene Oxide for HT-PEMFC .....  | 1905 |
| <i>Stuart Holmes, Jianuo Chen, Maria Perez-Page, Zunmin Guo</i>   |      |
| (Digital Presentation) The Optimization of Polypyrrole Concentration to Synthesize Hollow Fe, Co, and Nitrogen Doped Carbon Spheres with Improved Oxygen Reduction Reaction Performance.....                      | 1907 |
| <i>Nguyen Quoc Hao, Jinsoo Kim</i>  |      |

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| Influence of Shell Thickness on Durability of Ru@Pt Core-Shell Catalysts for Reformate PEM Fuel Cells.....                   | 1908 |
| <i>Viktoriya Berova, Alba Garzón Manjón, Miquel Vega-Paredes, Christina Scheu, Tilman Jurzinsky</i>                          |      |
| Lignin-Based N-Doped Nanocarbons for the ORR.....  | 1910 |
| <i>Kätlin Kaare, Ivar Kruusenberg, Aleksandrs Volperts, Galina Dobeleva, Aivars Zhurinskis</i>                               |      |
| ORR Activity and Surface Strain Relations of Commercial Pt Alloy Catalysts.....  | 1912 |
| <i>Benedikt Axel Brandes, Daniel Kelly, Pei Liu, Thomas Willum Hansen, Jens Oluf Oluf Jensen, Qingfeng Li, Lars Cleemann</i> |      |
| Proton Exchange Membrane Fuel Cell Flow Field Configuration: Modelling and Experimental Verification.....                    | 1914 |
| <i>Ivan Tolj, Zeljko Penga, Petar Bosnic, Gojmir Radica</i>  |      |
| Strain-Stabilized 1T Phase Ruthenium Sulfoselenide Monolayer Nanotubes for Oxygen Reduction Reaction in Alkaline Medium..... | 1916 |
| <i>Myeong-Geun Kim, Dong Wook Lee, Daeil Choi, Sung Jong Yoo</i>   |      |

### **I03 - Electrocatalysts 5**

|  |      |
|--|------|
| 3D Printed Carbon Aerogels for Polymer-Electrolyte Fuel Cells.....   | 1918 |
| <i>Anthony D. Santamaria, Swetha Chandrasekaran, Oliver Philbrick, Marcus Andre Worsley</i>  |      |
| Square-Pyramidal Fe-N <sub>4</sub> with Defect-Modulated O-Coordination: Two-Tier Electronic Structure Fine-Tuning for Enhanced Oxygen Reduction.....  | 1919 |
| <i>Zhi Li, Xuehai Tan Tan</i>  |      |
| Tuning the Activity of Silver Alloy Electrocatalysts for the Oxygen Reduction Reaction in Alkaline Media.....  | 1920 |
| <i>Gerard Montserrat Siso, Björn Wickman</i>   |      |
| Electrocatalytic Activity of Platinum-Nickel Layers Deposited on Nickel Foam for Formic Acid Oxidation in Acidic and Alkaline Media.....   | 1922 |
| <i>Antanas Nacys, Dijana Simkunaite, Benjaminas Sebeke, Daina Upskuviene, Aldona Balciunaite, Ausrine Zabielaite, Vitalija Jasulaitiene, Loreta Tamasiunaite, Eugenijus Norkus</i>   |      |
| Anode Defects' Propagation to the Electrolyte and Catalyst Layers in Polymer Electrolyte Membrane Fuel Cells.....  | 1923 |
| <i>Touhami Salah, Marie Crouillere, Julia Mainka, Jérôme Dillet, Christine Nayoze-Coynel, Corine Bas, Laetitia Dubau, Assma El Kaddouri, Florence Dubelley, Fabrice Micoud, Marian Chatenet, Yann Bultel, Olivier Lottin</i> |      |
| (Digital Presentation) Activated Carbon Supported Ni-Co Layered Double Hydroxides Nanowires: An Effective and Low-Cost Electrocatalyst Towards Ethanol Oxidation Reaction in Alkaline Media.....                             | 1925 |
| <i>Sarmistha Baruah, Akshai kumar Alape Seetharam, Nageswara Rao Peela</i>   |      |
| (Digital Presentation) Effects of Catalyst Dimension Parameters on Local Oxygen Transport in Cathode Catalyst Layer of Proton Exchange Membrane Fuel Cell.....   | 1926 |
| <i>Xiang Li, Fumin Tang, Bing Li, Haifeng Dai, Guofeng Chang, Pingwen Ming</i>   |      |
| (Digital Presentation) Oxygen Reduction Activity, Durability and Structural Transformation of Pt-Ni Nanowires in the Presence and Absence of Pt-Ni Nanoparticles.....  | 1927 |
| <i>Masaru Kato, Yoshimi Iguchi, Yuta Kato, Tianchi Li, Yu Zhuang, Ichizo Yagi</i>  |      |
| (Digital Presentation) Effects of Foreign Elements Added Oxide-Based Electrocatalyst for Oxygen Reduction Reaction as Non-Precious Metal Cathodes.....   | 1928 |
| <i>Koichi Matsuzawa, Momo Obata, Yuu Takeuchi, Yoshiro Ohgi, Kaoru Ikegami, Takaaki Nagai, Ryuji Monden, Akimitsu Ishihara</i>   |      |

## I04-RENEWABLE FUELS VIA ARTIFICIAL PHOTOSYNTHESIS OR HETEROCATALYSIS

8

### **I04 - Production of Liquid Fuels or High-Value Chemicals**

- Ammonia Synthesis Via Electrochemical Atomic Hydrogen Permeation between 25 and 100 C ..... 1931  
*Davide Ripepi, Riccardo Zaffaroni, Heman Schreuders, Bart Boshuizen, Fokko Mulder*
- Influence of the Electrode-Electrolyte Interface on the Product Distribution of the HMF  
Electroreduction ..... 1933  
*Ricarda Kloth, Dmitry V. Vasilyev, Karl J. J. Mayrhofer, Ioannis Katsounaros*
- Electrochemical Conversion of Methane to Ethylene Utilizing Highly Durable Barium Niobate  
Perovskites..... 1935  
*Kannan Ramaiyan, Luke H Denoyer, Angelica Benavidez, Kyle Troche, Fernando H. Garzon*
- (Digital Presentation) Achieving High Selectivity for the Nitrogen Reduction Reaction through the  
Mars-Van Krevelen Mechanism ..... 1936  
*Denis Johnson, Abdoulaye Djire*
- (Invited) Photoelectrochemical Glycerol Oxidation to Value-Added Commodity Chemicals Using  
BiVO<sub>4</sub>-Based Photoanodes..... 1937  
*Adam Hilbrands, Kyoung-Shin Choi*
- (Invited) Dye-Sensitized Photoelectrochemical Cells with Hydrogen-Atom Transfer Co-Catalyst  
for Oxidative Lignin Decomposition..... 1938  
*Jae-Joon Lee*

### **Keynote Talk on Absorption, Separation and Catalysis toward High-Value Chemicals-Digital**

- (Keynote, Digital Presentation) Environmental Remediation and Conversion of Pollutants to High-  
Value Chemicals by Integrated Adsorption-Separation-Electrocatalysis Processes ..... 1939  
*Jian-Mei Lu*

### **I04 - Solar Water Splitting 1**

- (Invited) Optimization of Z-Scheme Photocatalytic Reactors for Solar Water Splitting ..... 1940  
*Zejie Chen, Sam Keene, William Gaieck, Gabriel S. Phun, Robert Stinson, William D. H. Stinson, Yinxian Wang, Luisa Barrera, Zijie Chen, Mike Mayer, Kenta Watanabe, Tea Yon Kim, Brian Zutter, Aliya S. Lapp, Mingjie Xu, Yaset Acevedo, Jennie Huya-Kouadio, Brian James, Akihiko Kudo, Xiaoqing Pan, Katherine Hurst, Alec Alec Talin, Daniel V. Esposito, Rohini Bala Chandran, Shane Ardo*
- (Invited) A Coating Strategy for Heterogeneous Photocatalysis Producing Renewable Fuels..... 1941  
*Shu Hu*
- (Invited) Photo-SECM Measurements of Water Splitting at Single Semiconductor Particles ..... 1943  
*Gaukhar Askarova, Mahdi Hesari, Koushik Barman, Michael Mirkin*
- (Invited, Digital Presentation) Chalcopyrite-Based Devices for Photoelectrochemical Water  
Splitting: Challenges and Opportunities ..... 1944  
*Nicolas Gaillard*
- (Digital Presentation) Nickel-Iron Electrocatalysts Modified with Group 11 Metals Achieving 1 A  
cm<sup>-2</sup> of Oxygen Evolution in Buffered Near-Neutral pH Electrolyte..... 1945  
*Takeshi Nishimoto, Tatsuya Shinagawa, Kazuhiro Takanabe*
- Effect of Heat Exchanger on the Operation of a Directly Coupled Photovoltaic-Electrolyser ..... 1947  
*Erno Kempainen, Rory Bagacki, Christian Schary, Rutger Schlatmann, Sonya Calnan*
- Alternate-Target Layer-By-Layer Pulsed Laser Deposition of Epitaxial BiVO<sub>4</sub> Thin Films ..... 1949  
*Erwin Fernandez, Dennis Friedrich, Roel van De Krol, Fatwa Abdi*



(Digital Presentation) Photo-Thermo-Electrochemical Cells for on-Demand Solar Power and Hydrogen Generation ..... 1953  
*Yuzhu Chen, Meng Lin*

(Digital Presentation) Effects of Thermal Convection on Species Transport in Photocatalytic Suspension Reactors ..... 1955  
*Zijie Chen, Mike Mayer, Xingze Dai, Rohini Bala Chandran*

### **I04 - Solar Water Splitting 2**

Modeling the Effects of Coatings, Light Absorption, and Mass Transfer on Solar-to-Hydrogen Efficiencies in Z-Scheme Photocatalytic Reactors ..... 1957  
*Luisa Barrera, Robert Stinson, Shane Ardo, Daniel V. Esposito, Rohini Bala Chandran*

(Invited) Kinetics of Dye-Sensitized Water Oxidation Catalysis in Natural Sunlight ..... 1958  
*Frances Houle, Ramzi Massad, Thomas P Cheshire, Chenqi Fan*

### **I04 - Photocatalysts and Photoelectrochemical Cells**

(Invited) Solar Hydrogen Production with Particulate Photocatalysts ..... 1959  
*Kazunari Domen*

(Invited) Solar CO<sub>2</sub> Conversion into Liquid Fuels By Photoelectrochemical Approaches ..... 1961  
*Amol Uttam Pawar, Ignasia Handipta Mahardika, Young Soo Kang*

### **Energy Technology Division Supramaniam Srinivasan Young Investigator Award Address**

(Energy Technology Division Supramaniam Srinivasan Young Investigator Award) Materials and Capability Development in Photo- and Electro-chemical Electrons-to-Molecules (E2M) Device Research ..... 1963  
*James L. Young*

### **I04 - Solar Water Splitting 3**

(Invited) A Novel Co-Doping Strategy for Efficient Solar Water Splitting ..... 1964  
*Ji-Hyun Jang*

(Invited, Digital Presentation) Neutral pH Water Electrolyzer: Can It Become a Disruptive Technology for Green Hydrogen Production? ..... 1965  
*Kazuhiro Takanabe*

(Invited) Nanoscale Electrocatalyst/Semiconductor Interfaces As Charge-Carrier-Selective Contacts in Photocatalytic and Photoelectrochemical Systems ..... 1966  
*Shannon W. Boettcher, Aaron James Kaufman, Meikun Shen*

(Invited) Bulk Heterojunction Organic Semiconductor Photoelectrodes and Photocatalysts for Solar-Driven Water Splitting ..... 1967  
*Kevin Sivula*

### **I04 - Photocatalysis Session in Honor of Professor Bunsho Ohtani**

(Invited) CdS/Pd Photocatalytic Bipolar Membrane for Selective Reduction and Oxidation Processes ..... 1968  
*Prashant V Kamat, Federica Costantino*

(Invited) Revisiting Functions of Gold Nanoparticles in Photocatalysis ..... 1969  
*Nianqiang Wu*

(Invited) Bacterial Biofilms As Active Components of Electrocatalytic and Photoelectrochemical Systems for Reduction of Carbon Dioxide ..... 1970  
*Pawel J. Kulesza, Ewelina Seta-Wiaderek, Anna Wadas, Iwona A. Rutkowska, Weronika Lotowska*

|  |      |
|--|------|
| (Invited) Surface Photovoltage Spectroscopy on BiVO <sub>4</sub> , Gallium Phosphide, and CuGa <sub>3</sub> Se <sub>5</sub> Photoelectrodes in Contact with Aqueous Electrolytes ..... | 1972 |
| <i>Frank E Osterloh, Sahar Daemi, Anna Kundmann, Kathleen Becker, Ye Cheng</i>   |      |
| (Invited, Digital Presentation) Controlling the Energy Structure of Ag(In,Ga)S Quantum Dots for Photocatalytic H <sub>2</sub> Evolution .....  | 1973 |
| <i>Tsukasa Torimoto, Tatsuya Mori, Tatsuya Kameyama, Taro Uematsu, Susumu Kuwabata</i>   |      |
| (Invited, Digital Presentation) Design, Preparation and Characterization of Photofunctional Materials Based on Energy-Resolved Distribution of Electron Traps .....                    | 1975 |
| <i>Bunsho Ohtani</i>   |      |

#### **I04 - Mechanistic Studies on Semiconductors and Photocatalysts**

|  |      |
|--|------|
| (Invited) Probing the Atomic and Electronic Structure of Working Energy Materials with x-Ray Spectroscopy .....                    | 1976 |
| <i>Chung-Li Dong</i>   |      |
| (Invited) In Situ Time-Resolved Probe of Charge Carrier Dynamics at Planar Semiconductor Photoelectrode/Liquid Interface .....     | 1977 |
| <i>Tianquan Lian</i>   |      |
| (Invited) Discovering Bottlenecks and Opportunities in Hybrid Solar Light Harvesting Systems By Ultrafast X-Ray Spectroscopy ..... | 1978 |
| <i>Oliver Gessner</i>  |      |
| Space-Resolved Mapping of Catalytic Activity in Electrolysers By Infrared Imaging .....  | 1980 |
| <i>Thomas Burdyny, Hugo Pieter Iglesias van Montfort</i>   |      |
| Non-Adiabatic Dynamics Simulation of Plasmon-Mediated Chemistry .....  | 1981 |
| <i>Yu Zhang</i>  |      |
| (Digital Presentation) Characterization of Ultrafast Dynamics of Refractory Metal Nanoparticles of Interest as Photocatalysts..... | 1982 |
| <i>Gary P. Wiederrecht, Alexander Govorov</i>  |      |
| (Digital Presentation) Energy Resolved Dynamics of Mid-Gap and Surface States in ZnTe Photocathodes.....                           | 1983 |
| <i>Scott Cushing</i>   |      |

#### **I04 - Metal Oxides for Water Splitting**

|   |      |
|---|------|
| Ternary-Oxides CuWO <sub>4</sub> /BiVO <sub>4</sub> /FeCoO <sub>x</sub> Films for Photoelectrochemical Water Oxidation: Insights into the Photoinduced Charge Transfer Pathway..... | 1984 |
| <i>Renato Vitalino Goncalves, Lucas Gabriel Rabelo, Washington Santa Rosa, Luis Zampaulo</i>  |      |
| Recent Advancements in Morphologies of TiO <sub>2</sub> Nanotube Layers and Their Photocatalytic Performance.....   | 1985 |
| <i>Lina Marcela Sepúlveda Sepúlveda, Ivan Saldan, Hanna Sopha, Jan M. Macak</i>   |      |
| Large-Scale Synthesis of Photocatalytic TiO <sub>2</sub> Nanotube Layers.....   | 1986 |
| <i>Hanna Sopha, Michal Baudys, Josef Krysa, Jan M. Macak</i>  |      |
| Effects of Sn and Nb Doping on the Performance of Fe <sub>2</sub> TiO <sub>5</sub> As a Water Splitting Photocatalyst .....   | 1987 |
| <i>Mauricio A. Melo, Renato Vitalino Goncalves</i>  |      |
| Novel Iron-Based Cocatalysts for Photocatalytic Water Splitting and Nitrogen Reduction.....   | 1988 |
| <i>Judith Zander, Roland Marschall</i>  |      |
| Single-Atom Photocatalysis: Surface-Defect Engineered TiO <sub>2</sub> Anatase As a Tunable Platform for Hosting Co-Catalysts Atoms .....   | 1990 |
| <i>Shiva Mohajernia, Sina Hejazi, Manuela Kilian</i>  |      |
| NiO Modified CN Film As Photoanodes for Photoelectrochemical Water Oxidation.....   | 1992 |
| <i>Chang LIU, Jian Liu, Robert Godin</i>  |      |

|   |      |
|---|------|
| Intrinsic Cu Nanoparticle Decoration of TiO <sub>2</sub> Nanotubes: A Platform for Efficient Noble Metal Free Photocatalytic H <sub>2</sub> Production..... | 1993 |
| <i>Sina Hejazi, Shiva Mohajernia, Manuela Kilian</i>  |      |
| Screening Ruddlesden-Popper (n=1) Oxide Materials for Thermochemical Water Splitting By Density Functional Theory .....                                     | 1995 |
| <i>George E. Wilson, Ieuan Seymour, Andrea Cavallaro, Stephen Skinner, Ainara Aguadero</i>  |      |

#### **I04 - Metal Oxide Photocatalysts and Photoelectrochemical Cells**

|   |      |
|---|------|
| (Invited) Photoelectrochemical Energy Materials and Device .....                  | 1996 |
| <i>Soon Hyung Kang</i>  |      |
| (Invited) Engineering Challenges in Scaling-up Solar Water Splitting Devices..... | 1997 |
| <i>Fatwa Abdi</i>   |      |

#### **I04 - Carbon Dioxide Conversion 1**

|   |      |
|---|------|
| (Invited, Digital Presentation) Photo-Electrochemical Water and CO <sub>2</sub> Reduction Devices Operating Under Concentrated Radiation .....                                      | 1998 |
| <i>Sophia Haussener, Mahendra Patel, Etienne Boutin</i>   |      |
| (Invited) (Photo)Electrochemical Cells for Hydrogen Production and Carbon Dioxide Utilization .....   | 1999 |
| <i>Tsutomu Minegishi</i>  |      |
| (Invited, Digital Presentation) Relevant Production of Fuels Via Unifying Electrocatalytic Processes of Carbon Dioxide and Ammonia .....  | 2000 |
| <i>Jaeyoung Lee</i>   |      |
| (Invited) Tailored Electrochemical Interfaces for the Production of Renewable Fuels .....   | 2001 |
| <i>Maria Escudero-Escribano</i>   |      |
| (Invited) Influence of Fermi Level Engineering in Multi-Interface Photoelectrodes on Photoelectrochemical CO <sub>2</sub> Reduction.....  | 2002 |
| <i>Renata Solarska, Krzysztof Bienkowski</i>  |      |
| Operando Studies on High-Temperature CO <sub>2</sub> Electrolysis to Fuels .....  | 2003 |
| <i>Vipin Kamboj, Chinmoy Ranjan</i>   |      |
| Pulsed Electrochemical CO Reduction on Mass-Selected Cu Nanoparticles.....  | 2005 |
| <i>Degenhart Hochfilzer, Aoni Xu, Jakob Ejler Sørensen, Julius Lucas Needham, Kevin Krempf, Karl Krøjer Toudahl, Georg Kastlunger, Ib Chorkendorff, Karen Chan, Jakob Kibsgaard</i> |      |

#### **I04 Poster Session**

|   |      |
|---|------|
| Cu As Co-Catalyst for the Photo-Electrochemical CO Reduction on Multi-Junction Photoabsorbers .....                                     | 2007 |
| <i>Kathrin Naumann, Tim Tichter, Ole Hansen, Brian Seger, Ib Chorkendorff, Peter Vesborg</i>  |      |
| Photoanode Interface and Surface Treatment Effect in Dye-Sensitized Photo Electrochemical Systems on Oxidative Cleavage of Lignin ..... | 2009 |
| <i>Hyeong Cheol Kang, Saerona Kim, Kicheon Yoo, Gyu Leem, Jae-Joon Lee</i>  |      |

#### **I04 - Carbon Dioxide Conversion 2**

|   |      |
|---|------|
| Capping-Ligand Density on Cu Nanoparticles Determining Multi-Carbon Product Selectivity in Electrochemical CO <sub>2</sub> Reduction .....                    | 2010 |
| <i>Yusik Oh, Hye Ryung Byon</i>   |      |
| Photoelectrochemical CO <sub>2</sub> Reduction to Formate over Hybrid System of CdS Photoanode and Formate Dehydrogenase Under Visible Light Irradiation..... | 2012 |
| <i>Masanobu Higashi, Takumi Toyodome, Itsuki Tanaka, Tomoko Yoshida, Yutaka Amao</i>  |      |
| Role of Nafion Ionomer in Electrochemical Reduction of CO <sub>2</sub> on Au Clusters.....  | 2015 |
| <i>Shailendra Kumar Sharma, Vladimir Golovko, Aaron Timothy Marshall</i>  |      |

|   |      |
|---|------|
| Tuning the Polarity of Dinitrile-Based Electrolyte Solutions for CO <sub>2</sub> Electroreduction on Copper and Copper-Based Catalysts.....                     | 2017 |
| <i>Tatiana Morin Caamano, Yaser Abu-Lebdeh, Mohamed Houache, Martin Couillard, Arnaud Weck, Elena A. Baranova</i>   |      |
| Tuning CO <sub>2</sub> to CO Conversion on Metal-Doped Carbon Catalysts .....   | 2018 |
| <i>Saurav Chandra Sarma, Jesus Barrio, Magda Titirici, Ifan Erfyl Lester Stephens</i>   |      |
| (Digital Presentation) Investigations on the Ethanol/Ethylene Bifurcation and Restructure of Cu/Ag Catalysts for Electrochemical CO <sub>2</sub> Reduction..... | 2020 |
| <i>Yu Qiao, Brian Seger, Degenhart Hochfilzer, Björt Óladóttir Joensen, Wanyu Deng, Ib Chorkendorff</i>   |      |
| Tandem Electrochemical Conversion of CO <sub>2</sub> to Liquid Fuels and Chemical Feedstocks .....  | 2022 |
| <i>Mavis Kang, Manuel Kolb, Federico Calle-Vallejo, Boon Siang Jason Yeo</i>  |      |
| Fabrication of Low Loading Ag Electrodes for CO <sub>2</sub> Reduction Reaction in Zero-Gap Electrolyzer .....  | 2023 |
| <i>Amir Alihosseinzadeh, Anusree Unnikrishnan, Kunal Karan, Sathish Ponnuramgam</i>   |      |
| (Invited, Digital Presentation) Sub-Nanoscale Electrocatalyst Design for Enhanced CO <sub>2</sub> Conversion.....   | 2025 |
| <i>Youngkook Kwon</i>   |      |
| (Digital Presentation) Multi-Regression Analysis for Metal Sulfide-Based CO <sub>2</sub> Reduction.....   | 2026 |
| <i>Akira Yamaguchi</i>  |      |

## **I05-MECHANO-ELECTRO-CHEMICAL COUPLING IN ENERGY RELATED MATERIALS AND DEVICES 4**

### **I05 - SOFC/ SOEC Mechano-Electro-Chemical Coupling**

|  |      |
|--|------|
| (Invited) Operando Measurement of Redox-Originated Stress in Anode Supported SOFC.....   | 2028 |
| <i>Kento Oshima, Takumi Komaya, Yutaro Morishita, Satoshi Watanabe, Keiji Yashiro, Tatsuya Kawada</i>                          |      |
| Time-Resolved Characterization of Electrochemically-Induced Solid Oxide Cell Microstructure Evolution .....                    | 2030 |
| <i>Dalton Cox, Scott A Barnett</i>   |      |
| Electro-Chemical-Mechanical Coupled Modeling of Oxygen Electrodes in Solid Oxide Electrolyzer Cells .....                      | 2033 |
| <i>Xinfang Jin, Puvikkarasan Jayapragasam, Yeting Wen, Kevin Huang</i>   |      |
| Pt Current Collectors Artificially Boosting Si-Contaminated Praseodymium Doped Ceria Oxygen Surface Exchange Coefficients..... | 2035 |
| <i>Yuxi Ma, Theodore Burye, Jason Nicholas</i>   |      |
| (Invited) Electro-Chemo-Mechanical Effects in Mixed Ionic–Electronic Conductors.....   | 2037 |
| <i>Chia-Chin Chen</i>  |      |
| Modifying Crystal Symmetry and B-O Charge Distribution to Tailor Chemical Expansion in Mixed Conducting Perovskites .....      | 2038 |
| <i>Lawrence O. Anderson, Adrian Xiao Bin Yong, Elif Ertekin, Nicola H Perry</i>  |      |
| Large Non-Classical Electrostriction in Aliovalent and Isovalent Doped Ceria.....  | 2039 |
| <i>Maxim Varenik, Ellen Wachtel, David Ehre, Elad Gaver, Igor Lubomirsky</i>   |      |
| (Invited, Digital Presentation) Yet Another Symmetry Breaking in Electromechanical Materials.....                              | 2040 |
| <i>Nini Pryds</i>  |      |

### **I05 - Batteries Mechano-Electro-Chemical Coupling 1**

|   |      |
|---|------|
| (Invited) Electro-Chemo-Mechanics at Solid Electrolyte-Cathode Interfaces .....   | 2041 |
| <i>Bilge Yildiz, Younggyu Kim, Pjots Zguns</i>                                    |      |
| Solid State Batteries – Chemistry, Electrochemistry and Mechanical Concerns ..... | 2042 |
| <i>Shirley Meng</i>   |      |

|   |      |
|---|------|
| In Situ Strain Measurements on LAGP Solid Electrolyte in Symmetrical Li/LAGP/Li Battery during Li Plating and Stripping .....   | 2043 |
| <i>Bertan Ozdogru, Omer Ozgur Özgür Capraz</i>  |      |
| (Invited) Pressure-Tailored Lithium Deposition and Dissolution in Lithium Metal Batteries.....  | 2045 |
| <i>Chengcheng Fang, Bingyu Lu, Gorakh M. Pawar, Minghao Zhang, Diyi Cheng, Shuru Chen, Miguel Ceja, Jean-Marie Doux, Mei Cai, Boryann (Bor Yann) Liaw, Shirley Meng</i> |      |
| Combining Operando Techniques to Probe Chemo-Mechanical Evolution at Buried Solid/Solid Interfaces .....  | 2046 |
| <i>Lauren Marbella, Wesley Chang, Richard May, Michael Wang, Jeff Sakamoto, Daniel A. Steingart</i>   |      |

### **I05 Poster Session**

|   |      |
|---|------|
| (Digital Presentation) Understanding the Rate Limiting Process in a Pulse Laser Deposited Thin-Film Double Perovskite Electrode for Oxygen Reduction Reaction ..... | 2047 |
| <i>Vicky Dhongde, Uzma Anjum, Ajay Kumar, Rajendra Dhaka, Mohammad Ali Haider, Suddhasatwa Basu</i>   |      |

### **I05 - Batteries Mechano-Electro-Chemical Coupling 2**

|  |      |
|--|------|
| Understanding Coupled Electro-Chemo-Mechanics during In Situ Li Metal Anode Formation in Anode-Free Solid-State Batteries .....      | 2048 |
| <i>Eric Kazyak, Srinivas Yadavalli, Kiwoong Lee, Michael Wang, Adrian J. Sanchez, M.D. Thouless, Jeff Sakamoto, Neil P. Dasgupta</i> |      |
| (Invited, Digital Presentation) Chemo-Mechanics in Lithium Metal Solid State Batteries.....  | 2049 |
| <i>Kelsey Hatzell</i>  |      |
| (Invited) Mesoscale Reaction Kinetics Modulated By Structural and Compositional Heterogeneity in Battery Cathode Materials.....      | 2050 |
| <i>Yijin Liu</i>   |      |
| Heterogeneous Damage and Network Evolution in Composite Electrodes of Li-Ion Batteries.....  | 2051 |
| <i>Kejie Zhao, Feng Lin, Yijin Liu</i>   |      |
| A Study of Stress Evolution and Deformation in Cylindrical Cells, from before Manufacturing to End of Life.....                      | 2052 |
| <i>Justin Holloway, Maria Balart Murria, Melanie J Loveridge</i>   |      |
| (Invited) Modeling the Defect Chemistry, Transport Properties, and Stability of Anti-Perovskite Materials.....                       | 2053 |
| <i>Francesco Ciucci</i>  |      |
| (Invited) The Stability and Kinetics of the Li/Solid Electrolyte Interface.....  | 2055 |
| <i>Jeff Sakamoto</i>   |      |

### **I05 Digital Session - Batteries and Strain Characterization**

|  |      |
|--|------|
| (Digital Presentation) Electrochemical-Mechanical Coupling between Single-Ion Conducting Electrolytes and Metal Electrodes ..... | 2056 |
| <i>Eric A Carmona, Yueming Song, Paul Albertus</i>   |      |
| (Digital Presentation) Characterization of Anisotropic Strain in Anelastic Material By Raman Spectroscopy .....                  | 2057 |
| <i>Daniel Freidzon, Olga Kravynis, Ellen Wachtel, Igor Lubomirsky, Tsachi Livneh</i>   |      |

### **I05 - PEM Mechano-Electro-Chemical Coupling**

|  |      |
|--|------|
| Optimizing The Hot-Press Procedure Of High-Temperature Proton Exchange Membrane Fuel Cells For Adhesion Strength And Conductivity..... | 2059 |
| <i>Jared O Leader, Mark R Walluk, Michael G Waller, Thomas A Trabold</i>   |      |

|  |      |
|--|------|
| Experimental Characterization of Anisotropic Mechanical and Thermal Properties of Gas Diffusion Layers.....                                  | 2061 |
| <i>Marcus Ringström, Rakel Wreland Lindström, Göran Lindbergh, Henrik Ekström</i>  |      |
| Investigation of the Hydrogen Mass Fraction Distribution in a Polymer Electrolyte Fuel Cell through Experimentally Validated Simulation..... | 2063 |
| <i>Merit Bodner, Željko Penga, Viktor Hacker</i>   |      |
| Reinforced Metal Bipolar Plate Structure with Stiffening Rib Channel for Proton Exchange Membrane Fuel Cell.....                             | 2064 |
| <i>Choeun Kim, Youngseung Na</i>   |      |

## **I06-HETEROGENEOUS FUNCTIONAL MATERIALS FOR ENERGY CONVERSION AND STORAGE 3**

### **I06 - Advanced Imaging and Simulation 1**

|  |      |
|--|------|
| (Opening Keynote) Heterogeneous Functional Materials: Their Present Science and Engineering, and Their Role in the Future of Our Society ..... | 2066 |
| <i>Kenneth Reifsnider</i>  |      |
| (Invited, Digital Presentation) Transport Characterization in Nano and Micron-Sized Multi-Component and Multi-Functional Materials .....       | 2068 |
| <i>Sophia Haussener</i>  |      |

### **I06 - Advanced Imaging and Simulation 2**

|   |      |
|---|------|
| (Invited) A Macro-to-Nano Zoom through the Hierarchy of a Lithium Ion Battery .....   | 2069 |
| <i>Yijin Liu</i>  |      |
| (Invited) Self-Absorption Correction in X-Ray Fluorescence Imaging.....   | 2070 |
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**LM: Late Presentations in Sensors (Monday)**

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## M02-BIOSENSORS, LAB-ON-CHIPS, POINT-OF-CARE TESTING, IN-VITRO AND IN-VIVO IMAGING

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