

Solid Oxide Electrolysis:
Fuels and Feedstocks from
Water and Air

Faraday Discussion



13-15 July 2015
York, UK

Monday 13 July

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| 11:30 | Registration, Tea and Coffee | |
| 12:25 | Welcome and Introductions John Irvine, <i>Chair of Scientific Committee</i> | |
| 12:35 | Outline of Discussion Format Abigail Hallowes and Victoria Richards <i>Royal Society of Chemistry Publishing Editors</i> | |
| | Session Chair: John Irvine | |
| 12:45 | Introductory lecture: Surface modifications of $\text{La}_{0.8}\text{Sr}_{0.2}\text{CrO}_{3-\delta}$-YSZ dual-phase membranes for syngas production John Hansen <i>Haldor Topsøe A/S</i> | Paper 5970 |
| | Session 1: Fundamental electrochemistry Session Chair: Ray Gorte | |
| 13:30 | Interpreting equilibrium-conductivity and conductivity-relaxation measurements to establish thermodynamic and transport properties for multiple charged defect conducting ceramics Robert Kee, Huayang Zhu, Sandrine Ricote and Grover Coors <i>Colorado School of Mines</i> | Paper 5978 |
| 13:35 | Kinetics of CO/CO_2 and $\text{H}_2/\text{H}_2\text{O}$ reactions at Ni-based and ceria-based solid-oxide-cell electrodes Christopher Graves, Christodoulos Chatzichristodoulou and Mogens Mogensen <i>University of Denmark</i> | Paper 6151 |
| 13:35 | Development of a diffuse reflectance infrared fourier transform spectroscopy (DRIFTS) cell for the in situ analysis of coelectrolysis in a solid oxide cell Denis Cumming, Rachael Elder, Christopher Tumilson, Rebecca Taylor, Sarayute Chansai, Ann Call, Johan Jacquemin and Chris Hardacre <i>University of Sheffield</i> | Paper 6149 |
| 13:40 | Is the surface oxygen exchange rate linked to bulk ion diffusivity in mixed conducting Ruddlesden–Popper phases? Steven McIntosh, Alex Tomkiewicz, Mazin Tamimi and Ashfia Huq <i>Lehigh University</i> | Paper 6389 |
| 13:45 | Discussion | |
| 15:00 | Afternoon Tea | |
| | Session 2: Materials Development Session Chair: Mogens Mogensen | |
| 15:30 | Surface modification of $\text{La}_{0.8}\text{Sr}_{0.2}\text{CrO}_{3-\delta}$-YSZ dual-phase membranes for syngas production John Vohs, Anthony Yu, Tae-Sik Oh, Ran Zhu, Alexa Gallegos and Raymond Gorte <i>University of Pennsylvania</i> | Paper 5980 |
| 15:35 | Oxygen deficient layered double perovskite as an active Cathode for CO_2 electrolysis using a solid oxide conductor Tae Ho Shin, Jae-Ha Myung, Maarten Verbraeken, Guntae Kim and John T.S. Irvine | Paper 6143 |

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| | <i>University of St Andrews</i> | |
| 15:40 | Co-electrolysis of steam and CO₂ in full-ceramic symmetrical SOECs: a strategy for avoiding the use of hydrogen as a safe gas <i>Albert Tarancón, Marc Torrell, Sergio García-Rodríguez, Alex Morata and Germán Penelas</i> <i>Catalonia Institute for Energy Research (IREC)</i> | Paper 5982 |
| 15:45 | Discussion | |
| 17:00 | Lightning presentations | |
| 17:30 | Poster Session and Wine Reception | |

Tuesday 14 July

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| Session 1: Fundamental Electrochemistry Continued Session Chair: John Irvine | | |
| 09:00 | Proton uptake in the H⁺-SOFC cathode material Ba_{0.5}Sr_{0.5}Fe_{0.8}Zn_{0.2}O_{3-δ}: transition from hydration to hydrogenation with increasing oxygen partial pressure <i>Rotraut Merkle, Daniel Poetzsch and Joachim Maier</i> <i>Max Planck Institute for Solid State Research</i> | Paper 5979 |
| 09:05 | Relating surface chemistry and oxygen surface exchange in LnBaCo₂O_{5-δ} air electrodes <i>Helena Téllez, John Druce, John Kilner and Tatsumi Ishihara</i> <i>International Institute for Carbon Neutral Energy Research (wpi-I2CNER)</i> | Paper 6154 |
| 09:10 | Electrochemistry of La_{0.3}Sr_{0.7}Fe_{0.7}Cr_{0.3}O_{3-δ} as an oxygen and fuel electrode for RSOFCs <i>Viola Briss, Beatriz Molero-Sánchez, Paul Addo, Aligul Buyukaksov and Scott Paulson</i> <i>University of Calgary</i> | Paper 6422 |
| 09:15 | Discussion | |
| 10:30 | Morning Tea | |
| Session 2: Materials Development Continued Session Chair: John Varcoe | | |
| 11.00 | Improved electrochemical stability at the surface of La_{0.8}Sr_{0.2}CoO₃ achieved by surface chemical modification <i>Bilge Yildiz, Nikolai Tsvetkov and Qiyang Lu</i> <i>Massachusetts Institute of Technology</i> | Paper 5981 |
| 11.05 | Oxygen exchange and transport in dual phase ceramic composite electrodes <i>John Druce, Helena Téllez, Tatsumi Ishihara and John Kilner</i> <i>Kyushu University</i> | Paper 6137 |
| 11.10 | Calcium manganite as oxygen electrode materials for reversible solid oxide fuel cell <i>Chengsheng Ni and John Irvine</i> <i>University of St Andrews</i> | Paper 6124 |
| 11:15 | Discussion | |
| 12:30 | Lunch | |
| Session 3: System studies Session Chair: Tatsumi Ishihara | | |
| 13:30 | A techno-economic model of a solid oxide electrolysis system <i>Joseph Hartvigsen, Daniel Milobar and S. Elangovan</i> | Paper 5976 |

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| | <i>Ceramatec, Inc.</i> | |
| 13:35 | Syngas production by high temperature steam/CO₂ coelectrolysis using solid oxide electrolysis cells Jian-Qiang Wang, <u>Xinbing Chen</u> , Chengzhi Guan, Guoping Xiao and Xianlong Du <i>Shanghai Institute of Applied Physics, Chinese Academy of Sciences</i> | Paper 5998 |
| 13:40 | Synthesis of ammonia directly from wet air using Sm_{0.6}Ba_{0.4}Fe_{0.8}Cu_{0.2}O_{3-δ} as the catalyst <u>Shanwen Tao</u> , Rong Lan, Khaled Alkhazmi and Ibrahim Amar <i>University of Strathclyde</i> | Paper 6519 |
| 13:45 | Discussion | |
| 15:00 | Afternoon Tea | |
| Session 4: Understanding durability Session Chair: John Vohs | | |
| 16:00 | Degradation of (La_{0.8}Sr_{0.2})_{0.98}MnO_{3-δ}-Zr_{0.84}Y_{0.16}O_{2-γ} composite electrodes during reversing current operation <u>Scott Barnett</u> , Gareth Hughes, Justin Railsback, Kyle Yakal-Kremiski and Danielle Butts <i>Northwestern University</i> | Paper 5974 |
| 16:05 | Evaluation of oxide ceramics as anodes for SOECs <u>Andreas Egger</u> , Nina Schrödl and Werner Sitte <i>Montanuniversitaet Leoben</i> | Paper 6028 |
| 16:10 | Discussion | |
| 17:00 | Close of sessions | |
| 19:00 | Pre-Dinner Drinks | |
| 19:30 | Conference Dinner | |

Wednesday 15 July

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| Session 4: Understanding durability Continued Session Chair: San Ping Jiang | | |
| 09:00 | Understanding the processes governing performance and durability of solid oxide electrolysis cells <u>Sune Ebbesen</u> , Xiufu Sun and Mogens Mogensen <i>Technical University of Denmark</i> | Paper 5975 |
| 09:05 | Synthesis of mesoporous nanocomposites for their application in solid oxide electrolysis cells: microstructural and electrochemical characterization <u>Marc Torrell</u> , Laura Almar, Alex Morata and Albert Tarancón <i>Catalonia Institute for Energy Research (IREC)</i> | Paper 6132 |
| 09:10 | Discussion | |
| 10:00 | Morning Tea | |
| Session 5: Oxygen Electrodes Session Chair: Scott Barnett | | |
| 10:30 | Chromium deposition and poisoning of La_{0.8}Sr_{0.2}MnO₃ oxygen electrodes of solid oxide electrolysis cells <u>San Ping Jiang</u> , Kongfa Chen, Junji Hyodo, Aaron Dodd, Na Ai, Tatsumi Ishihara and Li Jian <i>Curtin University</i> | Paper 5977 |
| 10:35 | Electrochemical stability of Sm_{0.5}Sr_{0.5}CoO_{3-δ}-infiltrated YSZ for solid oxide fuel cells/electrolysis cells | Paper 6153 |

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| | <u>Minfang Han</u> and Hui Fan <i>Tsinghua University</i> | |
| 10:40 | Electrode kinetics of the NiO porous electrode for oxygen production in the molten carbonate electrolysis cell (MCEC) <u>Lan Hu</u> , Göran Lindbergh and Carina Lagergren <i>KTH Royal Institute of Technology</i> | Paper 6136 |
| 10:45 | Discussion | |
| | Session Chair: John Irvine | |
| 12:00 | Concluding remarks lecture <u>Andreas Zuttel</u> <i>Empa</i> | Paper 6520 |
| 12:30 | Acknowledgements | |
| 12:45 | Close of meeting | |

Presenting authors are indicated in the programme by an underline. The affiliation is for the presenting author. If the presenting author of your paper has changed since abstract selection please email events@rsc.org. Please note that this is a draft programme and timings may change.