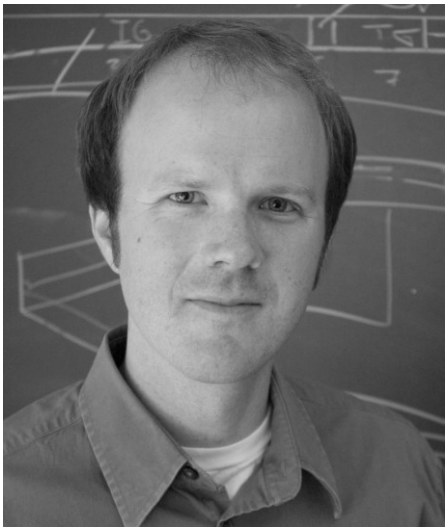
Electronic Supplementary Material (ESI) for Energy & Environmental Science.

Professor John Varcoe (Department of Chemistry, University of Surrey, UK) obtained both his 1st class BSc Chemistry degree (1995) and his Materials Chemistry PhD (1999) at the University of Exeter (UK). He was a postdoctoral researcher at the University of Surrey (1999 – 2006) before appointment as Lecturer (2006), Reader (2011) and Professor (2013). He is recipient of an UK EPSRC Leadership Fellowship (2010). His research interests are focused on polymer electrolytes for clean energy and water systems: more specifically, the development of chemically stable, conductive anion-exchange polymer electrolytes. He is also involved in the University's efforts on biological fuel cells.

Plamen Atanassov (MS in Chemical Physics from University of Sofia, and PhD in Physical Chemistry from the Bulgarian Academy of Sciences) is a Professor of Chemical & Nuclear Engineering at the University of New Mexico. He was the founding director of the UNM Center for Emerging Energy Technologies. Prof. Atanassov research focuses on electrocatalysis and bio-electrocatalysis and includes development of electrocatalyst for fuel cells, new materials and technologies for energy conversion and energy harvesting such as biological cells, and sensors design and integration. These programs are funded by NSF, DOD and DOE and industrial partners: Daihatsu, Ballard, AFFCC and CFDRC.

Dr Dario Dekel (Co-Founder and VP for R&D and Engineering, CellEra, Israel) received his MBA, MSc and PhD in Chemical Engineering from the Technion, Israel Institute of Technology. He was the chief scientist and top manager at Rafael Advanced Defense Systems, Israel, where he led the world's second largest Thermal Battery Plant. He left Rafael in 2007 to co-found CellEra, leading today a selected group of 14 scientists and engineers, developing the novel Alkaline Membrane Fuel Cell technology. He currently holds $3M government research grants from Israel, USA and Europe. Dr Dekel holds 14 battery and fuel cell patents.

Andrew M. Herring holds a B.Sc., Honors, in Chemistry and a Ph.D. in Inorganic and Structural Chemistry from the University of Leeds (UK). After postdoctoral appointments in Chemistry at the California Institute of Technology and in Basic Sciences at the National Renewable Energy Laboratory he joined the Colorado School of Mines in 1995, were he is now an Associate Professor of Chemical and Biological Engineering. Prof Herring's research interests are generally in materials or catalysis to enable renewable energy, energy efficiency, or energy storage. He has been studying ion conduction for low and intermediate temperature fuel cells for the last 19 years.



Professor Michael Hickner (Associate Professor, Department of Materials Science and Engineering, Pennsylvania State University, USA) focuses his research on the relationships between chemical composition and materials performance in functional polymers to address needs in new energy and water purification applications. His research group has ongoing projects in polymer synthesis, fuel cells, batteries, water treatment membranes, and organic electronic materials. His work has been recognized by a Presidential Early Career Award for Scientists and Engineers from President Obama (2009). He has co-authored seven US and international patents and over 100 peer-reviewed publications with > 5,400 citations.

Professor Paul Kohl (Hercules Inc./Thomas L. Gossage Chair, Regents' Professor, Georgia Institute of Technology, USA) received a Chemistry PhD (University of Texas, 1978). He was then involved in new chemical processes for silicon and compound semiconductor devices at AT&T Bell Laboratories (1978-89). In 1989, he joined Georgia Tech.'s School of Chemical and Biomolecular Engineering. His research includes ionic conducting polymers, high energy density batteries, and new materials and processes for advanced interconnects for integrated circuits. He has 250 papers, is past Editor of *JES* and *ESSL,* past Director MARCO Interconnect Focus Center, and President of the Electrochemical Society (2014-15).

Prof. Anthony Kucernak B.Sc., Ph.D,. CChem. MRSC (Professor of Physical Chemistry, Department of Chemistry, Imperial College London) has extensive experience in the study of various aspects of solid polymer electrolyte fuel cells, supercapacitors, and the design of new electrochemical techniques. His group currently studies a large number of aspects of fuel cell systems ranging from the development of new electrocatalysts, the development of new techniques to characterise and study electrocatalysts, the development of fuel cell electrodes, and the development of new methods to characterise fuel cells.

William E. Mustain received his Ph.D. in Chemical Engineering from the Illinois Institute of Technology in 2006. He then moved to Georgia Tech for his postdoctoral studies. He now runs the Laboratory for Electrocatalysts and Fuels at the University of Connecticut, and has been in that position since 2008. His group focuses on the development of novel structures and chemistries for the electrochemical synthesis of fuels, electrocatalysts for acidic and alkaline fuel cells and electrolyzers, Li-ion and aqueous batteries, etc. Their expertise related to this paper specifically is the purposeful utilization of carbonates in low temperature alkaline media.

Prof. Dr. Kitty Nijmeijer's (Professor Membrane Science & Technology, University of Twente, Netherlands) research is dedicated to the development and design of polymer membranes to control mass transport for energy and water applications (e.g. gas separation, CO2 capture, salinity gradient energy, water treatment and biorefinery applications). Kitty Nijmeijer was elected board member and vice president of the European Membrane Society and she chaired ICOM 2011, the world's largest conference on membrane science and technology. She is editorial board member of the Journal of Membrane Science.

Keith Scott (Professor of Electrochemical Engineering) is an experrt in electrochemical cell design, scale-up and modelling, membrane and electrocatalyst materials, electrochemical power sources and electrolysis. This expertise has come from operation of over 30 projects at a national and EU level all of which actively engage with industry. KS has been a partner is several EU projects in fuels cells and power sources and coordinated 3 EU Networks; the most recent currently being in energy storage with hydrogen using electrolysers (SUSHGEN). He has published over 400 refereed papers and 6 books as sole or co-author.

Professor Tongwen Xu (University of Science and Technology of China) received his BSc (1989) and MSc (1992) from Hefei University of Technology and his Chemical Engineering PhD (1995) from Tianjin University. He then studied polymer science at Nankai University (1997). He was visiting scientist at University of Tokyo (2000), Tokyo Institute of Technology (2001) and Gwangju Institute of Science and Technology (Brain Pool Program Korea award recipient). He has received a "New Century Excellent Talent" (2004) and an "Outstanding Youth Foundation" (2010) Chinese awards. His research interests cover membranes and related processes, particularly ion exchange membranes and controlled release.

Professor Lin Zhuang (Department of Chemistry, Wuhan University, China) earned his electrochemistry PhD (1998) at Wuhan University. He was then promoted to lecturer, associate professor (2001) and full professor (2003). He was a visiting scientist at Cornell (2004–05) and is an adjunct professor at Xiamen University. He is an editorial board member of *Science China: Chemistry*, *Acta Chimica Sinica*, and *Journal of Electrochemistry*. He was recipient of a National Science Fund for Distinguished Young Scholars. He was vice-chair of the physical electrochemical division of the International Society of Electrochemistry (2011-12) and China section chair of the Electrochemical Society (2010-11).