

# IFBF 2024 List of Conference Papers

Print ISBN: 978-1-9162004-4-9

## **Iron salt battery: challenges and advances**

Page 12

John P. Alper

*VoltStorageGmbH, Germany*

## **Organic SolidFlow Technology - combining flow and solid-state battery systems**

Page 14

Norbert Bartetzko, Christoph Hengst

*CMBlu Energy AG, Alzenau, Germany*

## **Testing and evaluation of stack materials**

Page 16

Martin Bayer, Thorsten Seipp, Philipp Schröder, Damian Pandel

*Volterion GmbH & Co. KG, Dortmund, Germany*

## **Ton-scale electrosynthesis of quinone negolytes and their cycling performance in commercial flow battery hardware**

Page 20

Eugene Beh, Meisam Bahari, Advait Murali, Amir Sina Hamed, Veenasri Vallem, Peter Symons

*Quino Energy, Inc., San Leandro, CA, USA Electrosynthesis Company, Inc., Lancaster, NY, USA*

## **Flow battery for refinery island, Singapore**

Page 22

Arjun Bhattarai

*VFlowTech Pte Ltd, Singapore*

## **Techno-economic analysis of redox flow batteries: a methodological overview**

Page 24

Aldo Bischi, Diana Cremoncini, Giuseppina Di Lorenzo, Guido Francesco Frate, Andrea Baccioli, Lorenzo Ferrari, Antonio Bertei

*Department of Energy, Systems, Territory and Constructions Engineering, University of Pisa, Pisa, Italy Department of Civil and Industrial Engineering, University of Pisa, Pisa, Italy*

## **Gaining scale, climbing the learning curve and lowering flow battery costs**

Page 28

Uwe Bögershausen, Jan Grosse Austing

*VANEVO GmbH, Germany*

## **Flow battery activities at the University of Strathclyde**

Page 30

Edward Brightman, Stuart Robertson, Stephen Lyth, Ryan Sims, Paul Tuohy, Leo Lue, Dowon Bae, Leonard Berlouis

*Chemical and Process Engineering, University of Strathclyde, Glasgow, United Kingdom*

*Pure and Applied Chemistry, University of Strathclyde, Glasgow, United Kingdom*

*PNDC, University of Strathclyde, Glasgow, UKMechanical and Aerospace Engineering,*

*University of Strathclyde, Glasgow, United Kingdom*

*Wolfson School of Mechanical, Electrical and Manufacturing Engineering, Loughborough University, Loughborough, United Kingdom*

**Long duration energy storage down under**

Page 32

Jill Caine

*Erne Energy, Wynyard, Australia*

**Detail investigation of VFB stack with a focus on single cell**

Page 34

Jiří Charvát, Jaromír Pociď, Jiří Vrána

*New Technologies – Research Centre, University of West Bohemia, Plzen, Czech Republic*

*Pinflow energy storage, s.r.o., Plzen, Czech Republic*

**Vanadium redox flow battery as an energy storage system for hybrid microgrid application**

Page 36

Bin-Hao Chen, Namu Neanchaleay, Ching-Chen Wu

*Department of Vehicle Engineering, National Taipei University of Technology, Taipei City,*

*Taiwan*

*Green Energy and Environment Research Laboratories, Industrial Technology Research*

*Institute, Tainan City, Taiwan*

**System integration, use cases and operation of 8MWh DC coupled vanadium flow batteries with solar farms in Australia and Canada**

Page 38

Jean-Louis Cols

*Invinity Energy Systems, Bathgate, Scotland, UK*

**Multiphysics modeling of a novel non-aqueous redox flow battery (NAQRFb)**

Page 40

Mirko D'Adamo, Nicolas Daub, Juan Manuel Paz, Lluís Trilla, Jose Saez

*Smart Energy, N Vision Systems And Technologies, Barcelona, Spain*

*IREC - Fundació Institut de Recerca en Energia de Catalunya, Sant Adrià del Besòs, Spain*

*Molecular Materials and Nanosystems & Institute for Complex Molecular Systems, University of Technology, Eindhoven, The Netherlands*

*Department of Chemical Engineering, Universidad de Malaga, Malaga, Spain*

**Electrochemical flow modelling of a semi-solid flow battery**

Page 42

Simone Dussi, Antoni Brentjes, Dimitris Ntagkras, Adriana Rioja Cabanillas, Riccardo

Zaffaroni, Michele Tedesco

*Heat Transfer and Fluid Dynamics, TNO, Delft, The Netherlands*

*Sustainable Processes and Energy Systems, TNO, Rijswijk, The Netherlands*

**Continuously produced bipolar plates via extrusion - challenges & opportunities in mass-production**

Page 44

Maximilian Fischer, Torsten Derieth

*Centroplast Engineering Plastics GmbH, Marsberg, Germany*

*3cD – compounding, coaching, consulting – Derieth, Uedem, Germany*

### **Pathways to high energy / power density redox flow battery**

Page 46

Cristina Flox, Dino Tonti, Nieves Casañ-Pastor, Juan Manuel Pérez  
*Department of Electrical Energy Storage, Iberian Centre for Research in Energy Storage,  
Campus University of Extremadura, Cáceres, Spain*  
*Institut de Ciència de Materials de Barcelona, CSIC, Campus UAB, Barcelona, Spain*

### **The development and characterisation of a kW scale soluble lead flow battery**

Page 48

Ewan Fraser, Richard Wills, Andrew Cruden  
*Faculty of Engineering and Physical Sciences, University of Southampton, Southampton, UK*

### **Framework for evaluating electrochemical characteristic of vanadium redox flow batteries**

Page 50

Peiyuan Gao, Emily G. Saldanha, Yangang Liang, Zhijie Xu, Amanda A. Howard, Wei Wang  
*Pacific Northwest National Laboratory, Richland, USA*

### **Flow batteries with zinc electrode – deposition and battery operation at various pH**

Page 52

David Gráf, Přemysl Ríchnr, Petr Šimek, Petr Mazúr, Jaromír Pociedič, Juraj Kosek  
*Dep. of Chemical Engineering, University of Chemistry and Technology Prague, Czechia*  
*New Technologies – Research Centre, University of West Bohemia, Pilsen, Czechia*

### **Cost engineering for key stack components (bipolar plate, electrode) in the GW scaled LDES market**

Page 54

Dr. Hartmut Gross, Dr. Hendrik Hemmelmann  
*Schunk Kohlenstofftechnik GmbH, New Business & Technology, Heuchelheim, Germany*

### **A coupled hydraulic and electrochemical stack and system model for aqueous organic flow battery: the MV/TEMPTMA system**

Page 56

Xinjie Guan, Maria Skyllas-Kazacos, Chris Menictas  
*School of Mechanical and Manufacturing Engineering, UNSW, Sydney, Australia*  
*School of Chemical Engineering, UNSW, Sydney, Australia*  
*CENELEST, German-Australian Alliance for Electrochemical Technologies for Storage of  
Renewable Energy, School of Mechanical and Manufacturing Engineering, UNSW, Sydney,  
Australia.*

### **Techno-economic investigation on VFB future profitability**

Page 58

Massimo Guarnieri, Nicola Poli, Cinzia Bonaldo, Michele Moretto  
*Department of Industrial Engineering, University of Padua, Padova, Italy*  
*RSE SpA, Milan, Italy*  
*Department of Economics and Management, University of Padua, Padova, Italy*

### **Recent developments in vanadium flow battery systems at H2, Inc.**

Page 60

Jeehyang Huh, Shin Han  
*H2, Inc., Daejeon, Republic of Korea*

### **From Lab to Megawatts: The evolution of TEMPO-based organic flow batteries**

Page 62

Tobias Janoschka, Yutong Zhu

*Jena Flow Batteries GmbH, Jena, Germany*

### **The advantages and challenges of the iron-lead single-flow battery for large-scale energy storage**

Page 64

Fengjing Jiang, Yang Fan, Weilong Jiang, Jiakuan Zhang, Mingruo Hu

*CIC energiGUNE, Vitoria-Gasteiz, Spain*

*Shanghai Jiao Tong University, Shanghai, China*

### **Reliability testing of redox flow battery cell stacks**

Page 66

Takashi Kanno, Katsuya Yamanishi, Takefumi Ito

*Redox Flow Battery System Division, Sumitomo Electric Industries, Ltd, Osaka, Japan*

### **Empowering LDES: GES disruptive hydrogen flow battery**

Page 68

Thomas Zakaria El Koura, Eneko Azàceta, Luca Barattini, Michele Tribbia, Pietro Iurilli,

Francesca Niccolai, Ilaria Pucher

*R&D Department, Green Energy Storage Srl, Trento, Italy*

### **Investigating the electrochemical behaviour of iron/hydrogen recombination cell in iron/iron redox flow batteries**

Page 70

Challuri Sai Venkata Akhil Kumar, Jens Noack

*Applied Electrochemistry, Fraunhofer Institute for Chemical Technology ICT, 76327 Pfingstal, Germany*

*German-Australian Alliance for Electrochemical Technologies for Storage of Renewable Energy (CENELEST), UNSW Sydney NSW 2052, Australia*

### **Investigating the effects of catholyte additives on the performance of lithium polysulfide flow batteries**

Page 72

Thomas Leckie, Pasidu Palawella, Dr Stuart Robertson, Dr Edward Brightman

*Department of Chemical and Process Engineering, University of Strathclyde, Glasgow, UK*  
*StorTera Ltd., Edinburgh, UK*

*Department of Pure and Applied Chemistry, University of Strathclyde, Glasgow, UK*

### **Commercialization of a novel Fe-Cr complex long-duration flow battery**

Page 74

Liyu Li and Qingtao Luo

*Cougar Creek Technologies, LLC. Kirkland, WA 98034 USA*

### **Accelerating the development of non-PFAS options for VFB membranes**

Page 76

Elisha Martin

*Invinity Energy Systems, Bathgate, Scotland, UK*

### **Demonstration of an aqueous Zn/Mn redox flow battery**

Page 78

Eleonora Natale, Federico Lissandrello, Eugenio Gibertini, Luca Magagnin  
*Surface and Electrochemical Engineering Laboratory, Dip. Chimica, Materiali e Ing. Chimica  
G.Natta, Politecnico di Milano, Italy*

### **Effects of aluminum, iron, and manganese sulfate impurities on the vanadium redox flow battery**

Page 80

Maedeh Pahlevaninezhad, Ehsan Aminfar, Majid Pahlevani, Edward Roberts  
*Department of Chemical and Petroleum Engineering, University of Calgary, 2500 University  
Dr NW, Calgary, AB T2N 1N4, Canada*  
*Centre for Energy Research and Clean Unconventional Technology Solutions, ARIS, SAIT,  
Aldred Centre, Calgary, AB T2M 0L4, Canada*  
*Department of Electrical and Computer Engineering, Queen's University, 99 University  
Avenue, Kingston, Ontario, K7L 3N6, Canada*

### **Vanadium market supply and demand**

Page 82

Terry Perles  
*Director, US Vanadium, Hot Springs, Arkansas*

### **Developing safe, stable and sustainable vanadium supply chain for flow battery industry in Europe**

Page 86

Dr. Jana Plananska  
*Director EU & Government Affairs, Norge Mineraler AS, Egersund, Norway.*

### **Capacity decay due to imperfect electrolyte mixing inside VFB tanks**

Page 88

Pablo A. Prieto-Díaz, Ange A. Maurice, Andrea Tròvo, Massimo Guarnieri, Marcos Vera  
*Dept. of Thermal and Fluids Engineering, University Carlos III of Madrid, 28911 Leganés,  
Spain*  
*Dept. of Industrial Engineering, University of Padua, 35131, Padova, Italy*

### **Optimised partial remixing procedure to mitigate capacity loss in imbalanced vanadium flow batteries**

Page 90

Thomas Puleston, Giacomo Marini, Andrea Trovò, Maria Serra, Ramon Costa, Massimo Guarnieri  
*Institut de Robòtica i Informàtica Industrial, Polytechnic University of Catalonia, Barcelona,  
Spain*  
*Department of Industrial Engineering, University of Padua, Padua, Italy*

### **Membraneless micro redox flow battery operating with inorganic and organic redox species**

Page 92

Alberto E. Quintero, Beatriz Oraá-Poblete, Daniel Perez-Antolin, Alberto Bernaldo de Quirós,  
Ange A. Maurice<sup>2</sup>, María J. Torres  
*R&D Department, Micro Electrochemical Technologies S.L., Leganés, Spain*  
*Thermal Engineering and Fluid Mechanics Department, University Carlos III de Madrid,  
Leganés, Spain*

*Structure of Matter, Thermal Physics, and Electronics Department, University Complutense de Madrid, Madrid, Spain*

### **Novel voltage control for C&I storage enabling seamless transition between grid-connected and island operation**

Page 94

Reshma Krishnan Radhakrishnan, Martin Steuber Application Engineer  
*R&D MF Engineering, TRUMPF Hüttinger GmbH + Co. KG, Freiburg, Germany*

### **The role of energy density for grid-scale batteries**

Page 96

David Reber, Sam R. Jarvis, Michael Marshak  
*Empa, Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland Renewable and Sustainable Energy Institute, University of Colorado Boulder, Boulder, USA Department of Chemistry, University of Colorado Boulder, Boulder, USA*

### **Mapping the low-temperature stability of vanadium electrolyte**

Page 98

Alasdair P. M. Robertson, Emma Wilson, Adam H. Whitehead  
*Invinity Energy Systems, Bathgate, Scotland*

### **Valuation methodology for the risk and performance analysis of non-hazardous flow battery chemistries**

Page 100

Milan Selle, Jan Girschik, Jens Burfeind, Anna Grevé  
*Electrochemical Energy Storage, Fraunhofer UMSICHT, Oberhausen, Germany*

### **The Kashiwazaki City, Japan, long duration flow battery energy storage project**

Page 102

Toshikazu Shibata, Takuya Sano, Yosuke Sato, Shuji Hayashi, Kazuyuki Kamada  
*Sumitomo Electric Industries, Ltd.*

### **Assessment of electrical safety risks associated with electrolyte leakage in VFBS**

Page 104

Bing Shu, Lai Wei, Jie Bao, Ke Meng, Maria Skyllas-Kazacos  
*School of Chemical Engineering, University of New South Wales, Sydney, Australia School of Electrical Engineering & Telecommunications, University of New South Wales, Sydney, Australia*

### **Characterisation of single cell performances within a ten-cell zinc/polyiodide flow battery stack**

Page 106

Lukas Siefert, Kevin Brandt, Falko Mahlendorf, Harry Hoster  
*Department of Energy Technology, University Duisburg-Essen, Duisburg, Germany*

### **Development of a membraneless redox flow battery**

Page 27

Athanasios Stergiou, Andinet Ejigu, Lewis Le Fevre, Amr Elgendy, Robert Dryfe  
*HalioGen Power, Manchester, UK Chemistry, University of Manchester, Manchester, UK*

### **Chronoamperometric state-of-charge measurements in redox flow battery electrolytes: Method overview and opportunities**

Page 108

Christian Stolze, Ivan A. Volodin, Martin D. Hager, Ulrich S. Schubert  
*Laboratory of Organic and Macromolecular Chemistry (IOMC), Friedrich Schiller University Jena, Jena, Germany*  
*Center for Energy and Environmental Chemistry Jena (CEEC Jena), Friedrich Schiller University Jena, Jena, Germany*

### **Long term multi-observable data for a state of charge and crossover description of vanadium flow batteries**

Page 110

Thorsten Struckmann\*, Niklas Janshen  
*Hamburg University of Applied Sciences, Hamburg, Germany*

### **Enhancing zinc-iodine flow battery performance: the role of ammonium acetate and bromide additives in cyclability and current density improvement**

Page 112

Phonnapha Tangthuam, Manasswee Suttipong, Suttipong Wannapaiboon, Pinit Kidkhunthod, Soorathep Kheawhom  
*Department of Chemical Technology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand*  
*Synchrotron Light Research Institute, Nakhon Ratchasima, Thailand*  
*Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok, Thailand*

### **Analytical bipolar modelling for redox flow battery design**

Page 114

Kunyapat Thummavichai, Prashant Agrawal, and Stephen Campbell  
*Mathematics, Physics and Electrical Engineering Department, Northumbria University, Newcastle, UK*

### **The Dualflow hybrid flow battery system**

Page 116

Kathryn Toghil, Luis Pinho, Mikhail Petrov, Anders Bienten, Filippo Fenini, Lars Pleth Nielsen, Kevin Lam, Micheal Scanlon, Eero Kontturi, Neptun Yousefi and Pekka Peljo  
*Department of Chemistry, Lancaster University, Lancaster, UK;*  
*Department of Engineering, Aarhus, DK*  
*ASP, Denmark,*  
*Department of Chemistry, Greenwich University, London, UK;*  
*University of Limerick, Ireland*  
*Aalto University, Finland;*  
*Turku University, Turku, Finland*

### **Policy spotlight: navigating current regulations and proposals in the European Union**

Page 118

Beata Viršumirska, Anthony Price  
*Flow Batteries Europe, Brussels, Belgium*

### **Vanadium flow battery - A field performance study proving a success story and technological advances**

Page 122

Adam H. Whitehead, Jie Sun, Martin Harrer, Fabio Denner  
*Enerox GmbH, Lower Austria, Austria*

**Materials advancements in flow battery technology**

Page 124

Vicki Wright, Ajith Soman, Ethan Bexley, Srijita Nundy  
*Technical Fibre Products Ltd, Burneside, Cumbria*

**Applications and markets of VFB in MENA**

Page 126

Gary Yang  
*KyRo-Green LLC, WA, USA*

**Towards semi-solid organic redox flow batteries: material screening, electrochemical performance, and reactor design optimization**

Page 128

Riccardo Zaffaroni, Adriana Rioja Cabanillas, Dimitris Ntagkras, Antoni Brentjes, Simone Dussi, Michele Tedesco  
*TNO Sustainable Processes and Energy Systems, Rijswijk, The Netherlands*  
*TNO Heat Transfer and Fluid Dynamics, Rijswijk, The Netherlands*

**An AI-enabled platform for energy storage value maximization**

Page 130

Hamid Zareipour, Manizheh Alipour  
*Electrical and Software Engineering, University of Calgary, Calgary, Canada*  
*Arcus Power, Calgary, Canada*

**The future is now: Insights into China's flow battery and energy storage market**

Page 132

Yutong Zhu, Tobias Janoschka  
*Jena Flow Batteries GmbH, Jena, Germany*