



2nd International

Zinc-Air Battery Workshop

Location: Sparebank1 SMN, Søndre gate 4, Trondheim, Norway **Date:** April 10th - 12th 2018



PROGRAM



Project: ZAS - Zinc-Air Secondary batteries based on innovative nanotechnology for efficient energy storage (GA no.: 646186)



Scientific committee

- ▶ Bernhard Gollas (TU Graz, Austria)
- ▶ Gongquan Sun (DICP Dalian, China)
- ▶ Hajime Arai (Tokyo Institute of Technology, Japan)
- ▶ Rainer Hald (VARTA microbattery, Germany)
- ▶ Hans-Ulrich Reichardt (Clausthal University of Technology, Germany)
- ▶ Jürgen Garcke (FCBAT, Ulm, Germany)
- ▶ Yun Zong (IMRE, Singapore)
- ▶ Edel Sheridan (SINTEF, Norway)

Administration/Local organization committee at SINTEF

- ▶ Edel Sheridan
- ▶ Mari Juel
- ▶ Sidsel Meli Hanetho
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- ▶ Hoai Thi Kim Nguyen
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Welcome

It is our great pleasure to welcome you to the 2nd International Zinc-Air Battery Workshop (IZABW2) in Trondheim, Norway. We are continuing the tradition which was established in Ulm, Germany, in 2016 where the 1st International Zinc-Air Battery Workshop was hosted. We are proud to present a scientifically strong program covering different aspects related to Zinc-air batteries. The Zinc-air batteries have many advantages such as high specific energy, low cost and good safety record, but challenges related to low cycle and calendar life have still to be overcome. We hope you take this unique opportunity to engage in discussions of critical issues for the development of zinc-air secondary battery solutions and to interact with colleagues from other research institutions over a cup of coffee, lunch or dinner.

We wish you a successful workshop!

2nd International Zinc-air Workshop (IZABW2)

The workshop is organized by the European ZAS (Zinc-air secondary batteries based on innovative nanotechnology for efficient energy storage, reference no. 646186) project.

We would like to thank the European Commission for supporting the workshop.

► Tuesday April 10th

18.00-20.00

Reception at Øysteinshall/Nidarosdomen cathedral



► Wednesday April 11th

09.00-09.30 *Registration and coffee*

Opening:

Chairman: *Edel Sheridan, SINTEF*

09.30 - 09.35 Welcome

09.35 - 10.20 A future view on Batteries for energy storage,
*Marcel Meeus, Sustesco **Key note***

10.20 - 10.40 ZAS - Zinc-Air Secondary innovative nanotech based batteries for efficient energy storage,
Mari Juel, SINTEF

10.40 - 11.00 Safety of Zn-Air Batteries in Comparison to other Batteries,
Jürgen Garche, University of Ulm, ZSW Ulm, TU Clausthal-Zellerfeld

*11.00 - 11.15 **Coffee break***

11.15 - 12.00 Impact of Composition on the operation of Zinc electrodes in alkaline Zinc-air cell,
*Ludwig Jörissen, Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg **Key note***

*12.00 - 13.00 **Lunch***

Zinc Anode

Chairman: *Hajime Arai, Tokyo Institute of Technology*

13.00 - 13.20 Mechanical coating of zinc particles with Bi₂O₃-based glasses as anode material for rechargeable zinc-air batteries,
Tobias Michlik, Chair of Materials Processing, University of Bayreuth

13.20 - 13.40 Improving zinc-slurries as anode for application in zinc-air batteries,
Thea Heinemeyer, Leibniz University Hannover

13.40 - 14.00 Investigation of slurry rheology during discharge in zinc-air flow batteries,
David Fuchs, University Duisburg-Essen

14.00 - 14.20 Revealing a self-healing mechanism occurring in zinc-based negative electrodes for alkaline batteries,
Vincent Caldeira, University Grenoble Alpes, CNRS, EASYL SA

*14.20 - 14.40 **Coffee break***

Modelling/Characterization

Chairman: *Birger Horstmann, Helmholtz Institute Ulm/ German Aerospace Center (DLR)*

- 14.40 - 15.00 3D Modeling and Simulation of Rechargeable Zinc-Air cells,
Tobias Schmitt, German Aerospace Center (DLR), Ulm University, Helmholtz Institute Ulm
- 15.00 - 15.20 Atomistic studies of anode and cathode materials for zinc-air batteries,
Steen Lysgaard, Technical University of Denmark (DTU)
- 15.20 - 15.40 Investigating Zn-air electrode degradation via DEMS and in-situ characterization,
Mathias Kjærgaard Christensen, Technical University of Denmark (DTU)
- 15.40 - 16.00 Designing Aqueous Electrolytes for Next-Generation Zinc-Air Batteries,
Simon Clark, Helmholtz Institute Ulm, German Aerospace Center (DLR)
- 16.00 - 16.20 Modeling Zinc Batteries with Ionic Liquid Electrolytes,
Max Schammer, Helmholtz Institute Ulm, German Aerospace Center, University of Ulm
- 16.30 - 17.30 Poster session
- 19.30 Workshop dinner at Rockheim (Brattørkaia 14, 7010 Trondheim)*

Posters

1. In-situ Study for Elucidating the 'Shape Change' of Zinc Electrodes,
Akiyoshi Nakata, Kyoto University
2. State-of-Charge Indicators in the Alkaline Zinc/Air Redox Flow Battery,
Christian Zelger, Graz University of Technology, CEST Competence Centre for Electrochemical Surface Technology GmbH
3. Structure and valency of $\text{Ca}_2\text{FeCoO}_5$ oxygen evolution catalysts,
Yoshitaka Aoki, Hokkaido University
4. Incorporation of iron into nickel-based phosphide as a forward-looking electrocatalyst for the oxygen evolution reaction in metal-air batteries,
Jan Majchel, German Aerospace Center (DLR)
5. Influence of operating conditions on the long-term performance of bifunctional air electrodes,
Birgit Pichler, Graz University of Technology
6. How current collectors and capacity go hand-in hand: an operando ICP-OES study on electrocorrosion,
Shahin Nikman, Lancaster University
7. Formation of porous Zn anode for Zinc-air batteries by cold sintering,
Cara King, SINTEF
8. Nickel cobalt oxide catalysts for use in zinc-air battery systems,
Matthew Holton, SINTEF
9. Development of Carbon-free Gas Diffusion Electrode,
Borislav Abrashev, IEES

► Thursday April 12th

08.00 - 08.30 *Coffee*

Plenary:

Chairman: *Marcel Meeus, Sustesco*

08.30 - 09.15 Stationary Storage of Electricity: Requirements, Challenges and the Zinc-Air Solution developed by EDF,
*Philippe Stevens, EDF **Key note***

09.15 - 10.00 Improved Durability in Zinc Air Batteries,
*Hajime Arai, School of Materials and Chemical Technology, Tokyo Institute of Technology **Key Note***

10.00 - 10.20 *Coffee Break*

Full cell/Gas Diffusion Electrode

Chairman: *Bernhard Gollas, TU Graz*

10.20 - 10.40 Electrochemical energy storage for renewable energy integration: zinc-air flow battery,
Ana Ibáñez, TÉCNICAS REUNIDAS

10.40 - 11.00 The Zinc Air Batteries at IEES - Past, Present, Future Plans,
Borislav Abrashev, IEES

11.00 - 11.20 Development of durable electrodes and their application to a tri-electrode zinc air battery,
Hiroataka Mizuhata, Materials and Energy Technology Laboratories, Corporate Research and Development BU, SHARP Corporation

11.20 - 11.40 Influence of processing parameters on structure, surface morphology, adsorption behaviour and electrochemical characteristics of electrospun carbonised fibre sheets as substrates for metal air battery cathodes,
Hans Kungl, Fundamental Electrochemistry (IEK-9), Forschungszentrum Jülich

11.40 - 12.00 Understanding electrolyte-electrode interactions in gas diffusion frameworks by PFG-NMR,
Steffen Merz, Fundamental Electrochemistry (IEK-9), Forschungszentrum Jülich

12.00 - 13.00 *Lunch*



Gas Diffusion Electrode

Chairman: *Hans-Ulrich Reichardt, Clausthal University of Technology*

13.00-13.20 Optimization of low-cost bifunctional air electrodes,
Aroa Ramos Mainar, CIDETEC

13.20-13.40 Oxygen GDEs for a rechargeable Zinc/air battery,
Mariappan Sakthivel, DECHEMA-Forschungsinstitut

13.40-14.00 Gas-diffusion-electrodes tailored to ionic liquids for use in metal-air
batteries,
Michael Lanfranconi, Westphalian University of Applied Science

14.00-14.20 Material screening for bifunctional cathodes and how operation conditions
influences their performance,
Alexander Kube, German Aerospace Center (DLR).

14.20-14.40 *Coffee break*

Gas Diffusion Electrode

Chairman: *Luis Colmenares, CIDETEC*

14.40-15.00 Exploration of electrode materials for bi-functional air electrode,
Masayoshi Yuasa, Kindai University

15.00-15.20 Development of $\text{Ni}_x\text{Co}_{3-x}\text{O}_4$ as bifunctional catalysts for rechargeable Zn-Air
batteries,
Kaushik Jayasayee, SINTEF

15.20 -15.40 Cobalt-based layered perovskite oxychlorides as bifunctional electrocatalysts
in alkaline media,
Yuto Miyahara, Graduate School of Engineering, Kyoto University

15.40-16.00 Development of a MnO_2 -based bifunctional oxygen electrocatalyst and its
application in zinc/air battery air-cathodes,
Michael Fink, University of Bayreuth

16.00-16.10 **Concluding remarks**



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