











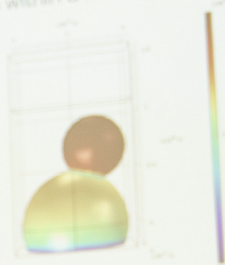
Motivation and Goals

Topic
Li-ion batteries lose capacity over time due to degradation mechanisms such as **Solid-Electrolyte Interface (SEI)** growth.

Experimental Challenges
SEI nanometric nature, air sensitivity, compositional variability.

Modeling Limitation
Continuum models typically neglect the local heterogeneity in the porous structure of electrodes.

Proposed Approach
A 4D modeling framework (3D space + time) based on COMSOL Multiphysics is employed to investigate local phenomena and identify preferential regions for SEI formation within a half-cell configuration.



4D electrostatic modeling of lithium-ion Battery performance degradation by SEI Growth
Battery 2020+ | Münster - 06/05/20







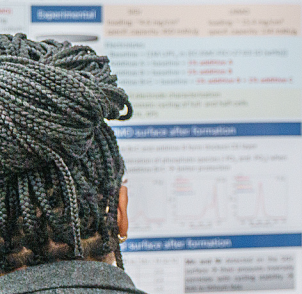






Advances in Electrochemical Performance **Mn_{1.5}O₂/Silicon-Graphite Cells**

Materials Science and Technology, 8092 (Zürcher) Switzerland
 Institute of Materials Science and Engineering, 7801 (Zürcher) Switzerland
 Institute of Engineering, 8092 (Zürcher) Switzerland
 Institute of Materials, 8092 (Zürcher) Switzerland



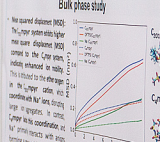
The battery cell was assembled in a glove box under Ar atmosphere. The electrolyte was 1M LiPF₆ in EC/DMC (1:1 v/v). The cell was cycled at 0.1C and 0.5C. The discharge capacity was measured at 25°C.



Abstract

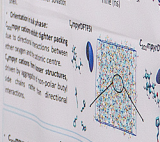
The chemistry of water and protons in an ionic liquid (IL) significantly affects to bulk phase and surface properties, resulting in a high understanding in advance to applications in energy storage, including batteries and supercapacitors. In this work, we have investigated the effect of water on the electrochemical performance of Mn_{1.5}O₂/Si/Graphite cells. The effect of water on the electrochemical performance of Mn_{1.5}O₂/Si/Graphite cells was studied using a combination of experimental and computational methods. The effect of water on the electrochemical performance of Mn_{1.5}O₂/Si/Graphite cells was studied using a combination of experimental and computational methods.

Bulk phase study



The bulk phase study was performed using a combination of experimental and computational methods. The results show that the discharge capacity of the Mn_{1.5}O₂/Si/Graphite cells increases over time, reaching a plateau around 150 mAh/g.

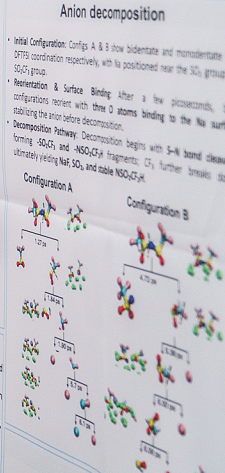
Interface study



The interface study was performed using a combination of experimental and computational methods. The results show that the discharge capacity of the Mn_{1.5}O₂/Si/Graphite cells increases over time, reaching a plateau around 150 mAh/g.

Anion decomposition

Initial Configuration: Configs A & B show bidentate and monodentate DFTFS coordination respectively, with Na positioned near the SO₃ group. Reorientation & Surface Binding: After a few picoseconds, configurations reorient with three O atoms binding to the Na surface, stabilizing the anion before decomposition. Decomposition Pathway: Decomposition begins with S-Na bond cleavage, forming -SO₃ and -NSO₃CF₃ fragments; CF₃ further breaks down, ultimately yielding NaF, SO₂, and stable NSO₂CF₃H.



Samson Yuxiu Lai¹, Abilash Kamini Thiagarajan¹, Heesoo Park¹, Alexey Kopoyev², Noriko Yoneda³, Ichiro U⁴, Daniel Brandstad⁵, Gabriela Suter⁶, Lutz Gohlke⁷, Pål¹, Robert Dominkovic¹, Ivana Hala¹, Tom Chamberlain¹, Andrew Moore¹, James Matos¹, Thomas Spang¹, Waldemar Müller¹, Constanța Hanganu¹, Peter Groll¹, Wouter Driessens¹, Department of Battery Technology, Institute for Energy Technology, Asker, Norway
¹Research Center for Macromolecular Design and Engineering, Drexel University, Philadelphia, PA, USA
²Department of Chemistry, University of Oslo, Oslo, Norway
³Department of Chemistry, Ångström Laboratory, Uppsala University, Uppsala, Sweden
⁴Department of Materials Chemistry, National Institute of Chemistry, Ljubljana, Slovenia
⁵Technical Institute of Physics, University of Applied Sciences, Osnabrück, Germany
⁶Department of Chemistry, University of Oslo, Oslo, Norway
⁷Department of Chemistry, University of Oslo, Oslo, Norway

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The European Commission has a goal of transitioning towards a carbon neutral society and reducing greenhouse gas emissions by at least 55% by 2030. It is therefore crucial to develop batteries with ultra-high performance beyond current capabilities to fulfill these goals and keep up with the increasing demand for batteries. The integration of self-healing and sensing functionalities aim to enhance the quality, reliability and lifetime of current and future battery chemistries



Biology Management System

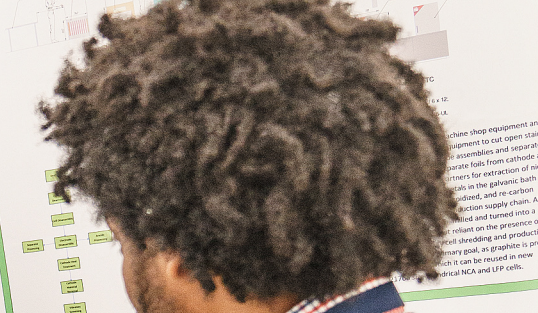
TS Sequencing	Self-Sealing
NPTV sequencing	NPTV sequencing
Δ -NPTV sequencing	Δ -NPTV sequencing

The diagram illustrates the Salamander botnet architecture, which integrates biological data with network security. At the top, the **Biology Management System** oversees two parallel processes: **TS Sequencing** (utilizing NPTV and Δ -NPTV sequencing) and **Self-Sealing** (also utilizing NPTV and Δ -NPTV sequencing). These processes feed into a central **Botnet**, represented as a large grey rectangular block. The Botnet is connected to several external components:

- Left Side:** A **Cultured Cell Line** (blue sphere) interacts with **Targeted Cells** (red spheres).
- Right Side:** A **Cell Culture** (cluster of colored spheres) interacts with **Targeted Cells**.
- Bottom Right:** A detailed view of a **Cell Culture** showing **Cell Culture Media** and **Cell Culture Vessels**.

Arrows indicate the flow of information and control between these components, highlighting the integration of biological research with cyber defense.

SALAMANDER battery in which a battery management system receives input from multiple embedded sensors and triggers external events to induce self-healing functionalities.

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The commercial opportunity behind the Dri





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IGB

...tion Makharrar,² Martin Eckert,¹ Peter
...ski,² Ulrike Wunderwald¹, Franziska

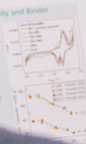
Electrode Scalability: Graphite Loading, Porosity and Binder

Challenges

- Optimal graphite loading, porosity & binder parameters unknown
- Large electrode fabrication & AGGB upscaling

Optimization of Electrode Parameters

... as active material and



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A Sensor-Actuator Platform for In-Situ Battery Health Monitoring and Self-Healing

Abstract

Rechargeable batteries are used for a wide range of applications, from consumer electronics to electric vehicles. However, they are prone to degradation and failure, which can be costly and dangerous. This project aims to develop a sensor-actuator platform for in-situ battery health monitoring and self-healing. The platform consists of a sensor array that can detect and measure the state of charge (SOC), state of health (SOH), and state of safety (SOS) of a battery. The sensor array is made of a novel material that can detect and measure the SOC, SOH, and SOS of a battery. The sensor array is connected to a microcontroller unit (MCU) that can process the data and send it to a computer. The computer can then analyze the data and provide feedback to the battery. The feedback can be used to adjust the charging current, voltage, and temperature of the battery, which can help to extend its life and improve its performance. The sensor-actuator platform is a novel and effective way to monitor and maintain the health of a battery. It can help to prevent battery failure and improve the safety and reliability of battery-powered systems.

Introduction

Batteries are used in a wide range of applications, from consumer electronics to electric vehicles. However, they are prone to degradation and failure, which can be costly and dangerous. This project aims to develop a sensor-actuator platform for in-situ battery health monitoring and self-healing. The platform consists of a sensor array that can detect and measure the state of charge (SOC), state of health (SOH), and state of safety (SOS) of a battery. The sensor array is made of a novel material that can detect and measure the SOC, SOH, and SOS of a battery. The sensor array is connected to a microcontroller unit (MCU) that can process the data and send it to a computer. The computer can then analyze the data and provide feedback to the battery. The feedback can be used to adjust the charging current, voltage, and temperature of the battery, which can help to extend its life and improve its performance. The sensor-actuator platform is a novel and effective way to monitor and maintain the health of a battery. It can help to prevent battery failure and improve the safety and reliability of battery-powered systems.

Connection 1: Sensor Array

The sensor array is made of a novel material that can detect and measure the SOC, SOH, and SOS of a battery. The sensor array is connected to a microcontroller unit (MCU) that can process the data and send it to a computer. The computer can then analyze the data and provide feedback to the battery. The feedback can be used to adjust the charging current, voltage, and temperature of the battery, which can help to extend its life and improve its performance. The sensor-actuator platform is a novel and effective way to monitor and maintain the health of a battery. It can help to prevent battery failure and improve the safety and reliability of battery-powered systems.

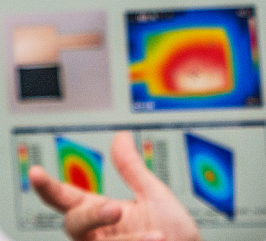


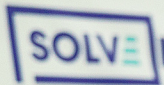
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Heating element for localized activation

The heating element is used to provide localized heating to the battery. It is connected to the MCU, which can control its temperature. The heating element is made of a novel material that can provide localized heating to the battery. The heating element is connected to the MCU, which can control its temperature. The heating element is made of a novel material that can provide localized heating to the battery.





Enabling room-temperature Solid Oxide Batteries through European innovation and collaboration

Motivation

Solid oxide batteries (SOBs) are a promising technology for energy storage and conversion. They offer high efficiency and long life, but their development is hindered by high operating temperatures and slow kinetics.

- 1. Develop new materials and structures to enable room-temperature operation.
- 2. Improve the kinetics of the electrochemical reactions.
- 3. Optimize the battery design for high power and energy density.

Objectives

The project aims to develop a new generation of SOBs that can operate at room temperature and have high power and energy density.

- 1. Develop new materials and structures to enable room-temperature operation.
- 2. Improve the kinetics of the electrochemical reactions.
- 3. Optimize the battery design for high power and energy density.



GRADUATE SCHOOL
Electrochemical Energy Storage

Graduate School Electrochemical Energy Storage GS-EES

AIMS

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The project is organized into three main research programs: Materials, Electrochemistry, and Battery Design.

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menu

STARTERS

- mixed salad | carrots | cucumber | corn | paprika | croutons | honey-mustard dressing | veggie dressing
- romesco salad | rocket | chickpeas | feta | grilled paprika | roasted pine nuts
- spanish pippirana salad | cucumber | tomato | paprika | onion | classic vinaigrette
- mediterranean bread basket
- butter | rocket-walnut dip | paprika-honey

mundus

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mundus



menu

MAINS

Chicken Salsitona & pasta bake £
Pineapple & hamman bake £
Mediterranean beef ragout (pasta) £
Cherry tomatoes (potato) £
Grilled paprika (potato) £
Eggplant Moussaka (potato) £
Pork & apple (potato) £
Pork & apple (potato) £
Cherry tomatoes (potato) £

menu

ON THE SIDE

Large butter sprouts £
Rosemary potatoes £
Fajitas £
Grilled vegetables & fresh herbs £
Roasted carrots £

BAILEY'S 2020



Merging industry and
research possibilities

Hosting one of Europe's leading
strategic battery events

