

PROJECT NEWSLETTER

ISSUE 2 • December 2021

Autonomous Self-Healing polymer based Components for high performance Lithium Ion Batteries



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 957225

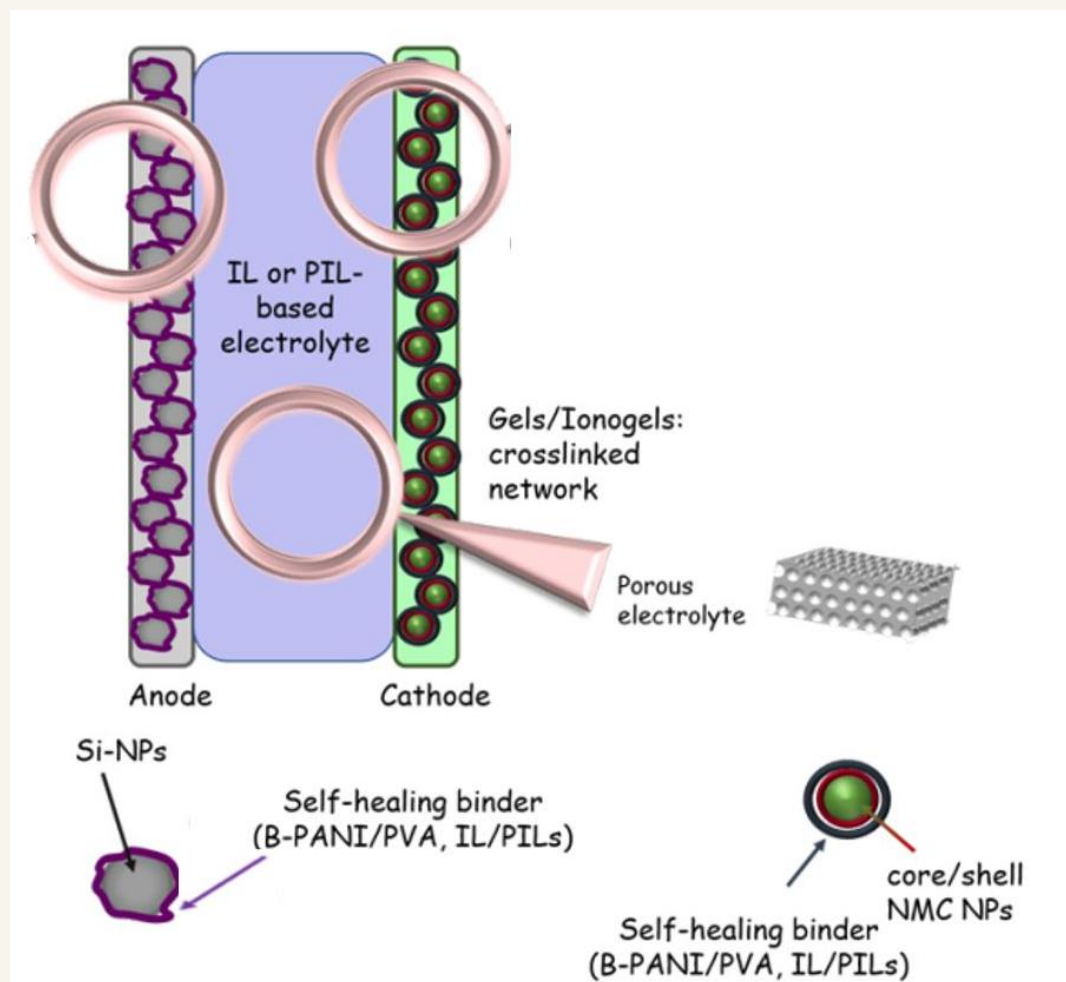


Battery 2030+ large-scale research initiative

Project Coordinator
Prof. Dr. Maitane Berecibar
Vrije Universiteit Brussel
Brussel, Belgium
Maitane.Berecibar@vub.de

THE BAT4EVER PROJECT FOCUSES ON

- The development of the **self-healing** battery materials and **their advanced characterization/atomistic modelling**.
- The **self-healing mechanisms** are related to the prevention of
 - the **micro-damages** at Si-anodes and at core/shell structured cathodes
 - **loss of material** at cathode surfaces caused during repetitive charge and discharge cycles.
- Further targets are **assembly and manufacturing of prototypes** using the developed **self-healing materials** and
- Observation of their performances through comprehensive **real-time tests** supported by **simulation of battery cells**.





BAT4EVER's FIRST ACHIEVEMENTS

Despite COVID restrictions and absence of face-to-face communication BAT4EVER consortium worked hard during the first project year to be in line with the project schedule and planned activities.

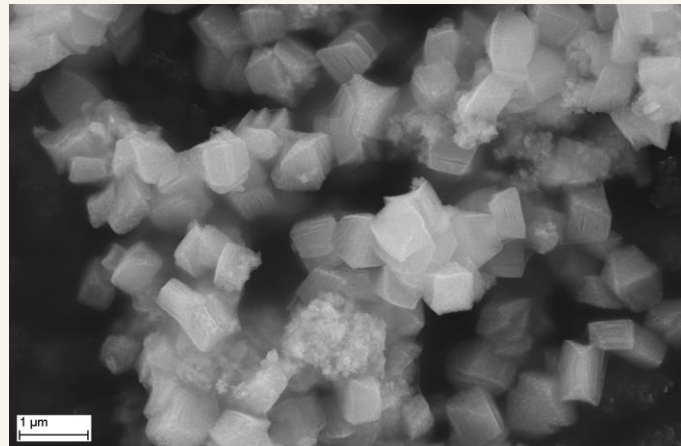
The following results were achieved so far:

- **WP2. Specification in Connection with Self-Healing Battery Technology:**
 - **Technical requirements**, significant process and safety test parameters are defined in document **D2.1**
 - **Production feasibility** related significant parameters and technical requirements are defined in document **D2.3**
 - Conditions for the **self-healing battery prototypes** are defined in document **D2.2**
- **WP3. Self-Healing Li-Ion Battery:**
 - Ionic liquids are successfully integrated into the **self-healing ionogels**
 - **Main parameters** for the synthesis of the **core/shell cathode** material are established
 - **SH-Polymers for Si-anodes** is optimized
- **WP4. Characterization and Modelling:**
 - **Microstructural characterization of core/shell cathode material** is carried out
 - **Modelling of cathode and anode material** structures under the lithiation processes is studied
 - First **electrochemical tests on NMC electrodes** and self-healing electrodes are done
- **WP5. Cell Production and Assembly:**
 - Initial **cell manufacturing trials** have been started
- **WP6. Validation and Evaluation:**
 - **Life-Cycle Assessment strategies and scenarios** are defined in document **D6.1**
- **WP7. Dissemination, Exploitation and Market Analyses:**
 - Project website www.bat4ever.eu and LinkedIn page <https://www.linkedin.com/company/bat4ever/> are launched (**D7.1**)
 - Two **Special Issues** in Open Access journals are opened
 - The Dissemination Plan (**D7.2**) and Exploitation Plan (**D7.3**) of the project are submitted

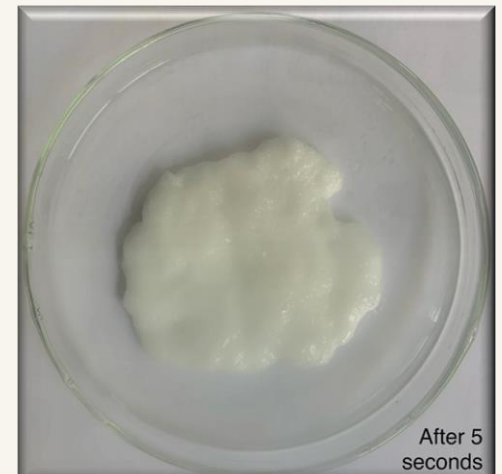
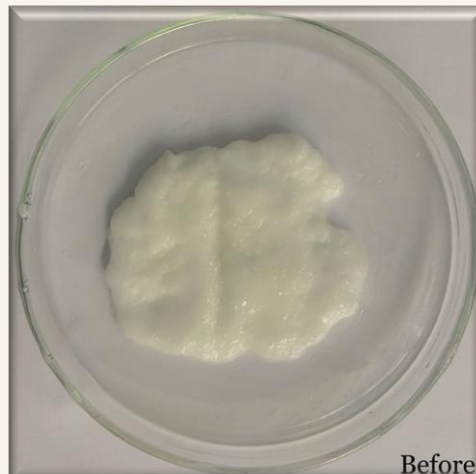
TAKE A LOOK INSIDE OF THE BAT4EVER RESEARCH

During the first project year the BAT4EVER consortium worked on the development of **self-healing materials for the next generation of Li-Ion batteries.**

- ✓ The first batches of the **Core/Shell structured NMC cathode particles** with Spinel chemistry were synthesized, accompanied with their electrochemical performance evaluation and full microstructural characterization by means of scanning electron microscopy (SEM), EDS analysis, XRD and RAMAN spectroscopy measurements



- ✓ The developed Silicon-based **self-healing anode** exhibited the disappearance of center dent already after 5 seconds



- ✓ **Ionic Liquids** were successfully embedded in a **self-healing ionogel electrolyte**



CROSS-LINKED COLLABORATION IN THE FRAME OF BATTERY 2030+

On 20th May 2021 **BAT4EVER** and **SPARTACUS** projects held a Joint Workshop devoted to the self-healing questions in the development of batteries.

Besides the members of both project consortiums, the workshop was attended by **Battery2030+** Project Coordinator, **Prof. Dr. Kristina Edström**.

The workshop was organized to define the cross-cutting issues within both projects related to the **Self-healing – Sensing – Modelling**. **Effects of Self-healing/Sensing on management systems, aging protocols, ecological and economical aspects and application** were highlighted by the participants.

The following aspects were discussed:

- Which signals/characteristics are needed to trigger self healing?
- How a (successful) self healing can be sensed and characterized?
- How in-situ and in-operando characterization in BAT4EVER contribute to the cell sensing activities of SPARTACUS?
- Is there an overlap of the modelling in BAT4EVER and SPARTACUS towards a multiscale modelling?
- How self-healing or sensing affects the CMS / BMS in the future?
- How stable is self-healing chemistry in accelerated aging protocols and abusive testing?
- Effects of self-Healing / Sensing on economical / ecological aspects / LCA etc..
- How can the cell sensing/self-healing be adapted in the cells for mobile phone application and other applications?



FOLLOW BAT4EVER

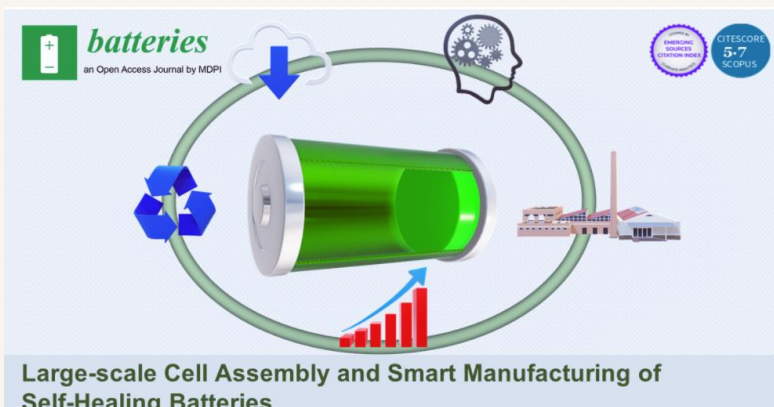
➤ **Project Webpage** www.bat4ever.eu

➤ **Social Media account** 

JOIN US with your scientific work in the SPECIAL ISSUES of Journals

- **Batteries** (ISSN 2313-0105) Large-scale Cell-Assembly and Smart Manufacturing of Self-Healing Batteries

Deadline for manuscript submissions: **31 May 2022.**



Large-scale Cell Assembly and Smart Manufacturing of Self-Healing Batteries

Guest Editors:

Prof. Dr. Maitane Berecibar

Dr. Kamil Burak Dermenci

[**Special Issue Flyer**](#)

- **Materials** (ISSN 1996-1944) Advanced and Smart Materials for Next Generation Batteries, Supercapacitors and Energy Harvesting

Deadline for manuscript submissions: **10 December 2022.**



Advanced and Smart Materials for Next Generation Batteries, Supercapacitors and Energy Harvesting

Guest Editors
Dr. Apurba Ray, Dr. Bilge Saruhan-Brings, Dr. Svitlana Nahirniak

Deadline
10 December 2022

mdpi.com/si/99784

Special Issue
Invitation to submit

Guest Editors:

Dr. Apurba Ray

Dr. Bilge Saruhan-Brings

Dr. Svitlana Nahirniak

[**Special Issue Flyer**](#)



CONTACTS

Dr. Bilge Saruhan-Brings

Dissemination and Exploitation

German Aerospace Center

Cologne, Germany

Bilge.Saruhan@DLR.de

+49 2203 601-3228

Dr. K. Burak Dermenci

Technical Project Coordination

Vrije Universiteit Brussel

Brussel, Belgium

Kamil.Burak.Dermenci@VUB.be

+32 2 629 28 01

Inès Boursot

Operational Management

Vrije Universiteit Brussel

Brussel, Belgium

Ines.Boursot@VUB.be

+32 476 604585



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