Newsletter
December, 2021

The vision for BATTERY 2030+ is to invent the batteries of the future, providing European industry with disruptive technologies and a competitive edge across the full value chain, that will enable Europe to take the lead in battery science and technology.

This newsletter gives you an update on what's going on within the initiative.
Enjoy your reading!

Länktext

A moment with Kristina Edström,
Coordinator of BATTERY 2030+

Thank you for supporting the BATTERY 2030+ initiative and being a part of our battery community!

So many BATTERY 2030+ highlights we can present from this year! We have organized a number of meetings like our own Annual meeting in October, the Battery Innovation Days in November, and a web-based course in manufacturing of battery electrodes and cells, just to name a few. We are also grateful to our excellence speakers that have contributed with international perspectives early mornings or late afternoons to fit to our European CET. We invite to you to read more on our web www.battery2030.eu where you also can see the recordings from our lectures, events, and the battery course.

Despite the covid-situation the research in our scientific projects is flourishing and success stories are now dropping in. You can find the links to Bat4Ever, Big-Map, Hidden, Instabat, Sensibat and Spartacus on our web or go directly to the projects themselves.

So, what can we expect for 2022? A renewed roadmap with the long-term vision of how to invent the way we invite the batteries of the future, more results and impact from our research projects, a series of excellence seminars, workshops and events highlighting the role of a strong European industry in relation to long-term research visions, new curricula to support buildings skills for the European industry, events for young scientists, etc. Follow us - we keep our web-page and social media updated with the latest events!

I wish you a very well-deserved holiday break, Merry Christmas and a Happy New Year.

Battery Innovation Days

A joint effort by the Europe's battery forces during the month of November.

As a co-organiser BATTERY 2030+ is very proud to have contributed with many talented speakers and topics to this successful seminar. The very first edition of Battery Innovation Days was a digital seminar co-organised by us, Batteries Europe, the Batteries European Partnership Association (BEPA) and Batteries 1st and 2nd IPCEIs. There were more than 2000 people registered and 1529 people who attend. The event was an opportunity for some of the industry's expert leaders who provided insight on the latest developments within the European R&I Battery domain, exchanged views on key strategic approaches to deploying crucial technologies, and future R&I needs for a more competitive and sustainable European battery value-chain. The event ran for three days, with 98 speakers, and 18 sessions. BATTERY 2030+ representatives engaged in many of these sessions and some of the more prominent panels, plenary and breakout sessions for the initiative were;

- **Research and Innovation across the European Battery value chain: the need for a comprehensive and complementary approach**. This was the first plenary session and was kicked off with a keynote speech by Maroš Šefčovič. It was followed by a presentation on the current European R&I Landscape for batteries and concluded with a panel discussion on the R&I challenges ahead for the European battery value chain, with our very own Kristina Edström participating in the panel.

- **Long term research for batteries: what are the next priorities?** This session opened with a presentation on long-term European roadmaps for battery research by Kristina Edström. Following, there was a panel discussion on what battery chemistries we can hope for in the future to benefit European industry. A second panel

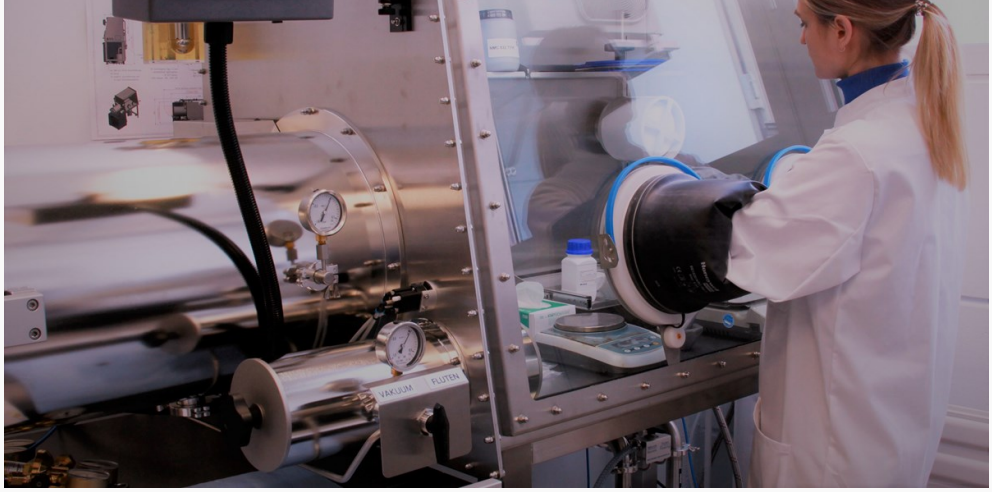
discussion concluded the session exploring how we can enable the chemistries of the future. This session also included a presentation by Tejs Vegge, coordinator of the Big-Map project on modular platforms for accelerated discovery of future sustainable battery chemistries.

- **Smart battery functionalisation: status and future**. Moderated by Kristina Edström, this session explored how the addition of sensors to the battery and an upgrade to battery management systems will help us better predict the status and lifespan of the battery. A panel discussion followed exploring the progress made in the field of sensors in battery cells with the presentation of Instabat, Sensibat and Spartacus. The session ended with a presentation focusing on self-healing mechanisms that will lead to improved battery cell functionalities including presentations about the Bat4Ever and Hidden projects.

- **Solid-state research, promising future, Next disruptive technologies**. This session, also moderated by Kristina Edström, allowed a deep dive into the next disruptive technologies being developed in the battery field, and the support needed to boost research. The session started with a presentation exploring the outlook of solid-state batteries, followed by a panel discussion on how to accelerate the research that will enable solid state batteries.

- **Jobs creation and bridging the skills gap across the European battery value chain.** This session was aimed at discussing the urgent need to create jobs and training opportunities in the battery industry. It was moderated by Silvia Bordoado and it opened with a presentation on job creation and how to meet the skill needs for a competitive and sustainable battery value chain and ended with a panel discussion on the importance of job creation and evolution in the battery industry.

Battery Innovation Days had also announced that they were giving out an award ‘Battery Young Research Award’, to recognise the commitment of students supporting scientific advancements in the field. The award was opened to all recent PhD graduate with a completed thesis on battery energy storage in Europe. The awardee was **Ana Cristina Martínez Maciel**, currently working as postdoctoral researcher at the University of Texas at El Paso. Congratulations Ana!



BAT4EVER and their progress on self-healing batteries

A smartphone battery with twice as long lifetime and twice as high continuous charge current as the current ones and without any danger of explosion or fire may well be the result of BAT4EVER's research. Their approach to achieve these goals is to equip all the components of Li-ion batteries, LiBs, with self-healing (SH) capabilities - in both novel polymerized ionic liquids, and polymer protected high charge-capacity silicon anodes. The cathodes are core/shell structured.

During its lifetime a battery suffers from discharge capacity fading, micro-cracking and loss of material. Moreover, there is danger of electrolyte leakage and the so-called "thermal runaway" which results in temperature elevation carrying the risk for internal short circuiting and damaging nearby components. These are all due to the chemical processes that take place during charging and discharging i.e. lithiation/de-lithiation.

The use of polymer-based materials that are enriched with self-healing mechanisms can prolong battery-life and increase safety. One way forward is to use silicon anodes. Silicon in lithium batteries can significantly increase their storage capacity. But there is a major problem to overcome; silicon has a large volume expansion when lithiated and micro-crack formation on de-lithiation. Bat4ever uses silicon nanoparticles that are embedded in SH-polymers to prevent this microcracking caused by volume changes of silicon particles. By surrounding the silicon particles with flexible SH-polymer that contain hydrogen bonding moieties the anode is protected due to diminished crack formation. This gives more mechanical strength and enhances the lithium uptake and cycle lifetime of the battery, explains project coordinator, Maitane Berecibar, professor at Vrije Universiteit Brussel.

The cathode materials are the key performing drivers of LiBs and determine how long you can talk on the phone, how far you can drive an electric car, how fast a battery can recharge and how much energy you can store from your solar panels. The composition of Bat4ever's cathode is of so-called NMC-type, consisting of nickel, manganese, cobalt and lithium with a core/shell-type sandwiched structure. Nickel delivers high energy density and enhance storage capacity at lower cost and contributes to a circular economy thanks to longevity, possible second life and recyclability. However, the Ni-oxidation limits its function causing capacity fade and deterioration of cycling performance. A surface stabilization of Ni-rich NMC-based cathode particles is therefore needed. Here comes the core/shell structured synthesis of NMC-particles, the SH-polymers and Ionogels to help. In fact, the SH-polymers and Ionogels developed within the Bat4ever project embed all the battery cell components and may also act as the separator itself.

-The SH-polymers are pretty well underway. My group has been synthesizing

core/shell-structured NMC cathode particles. The so-far produced quantities are small but we are working on to scale them up from lab-bench to prototype manufacturing and even to fit to industrial production, says Dr Bilge Saruhan-Brings at German Aerospace Center in Cologne/Germany.

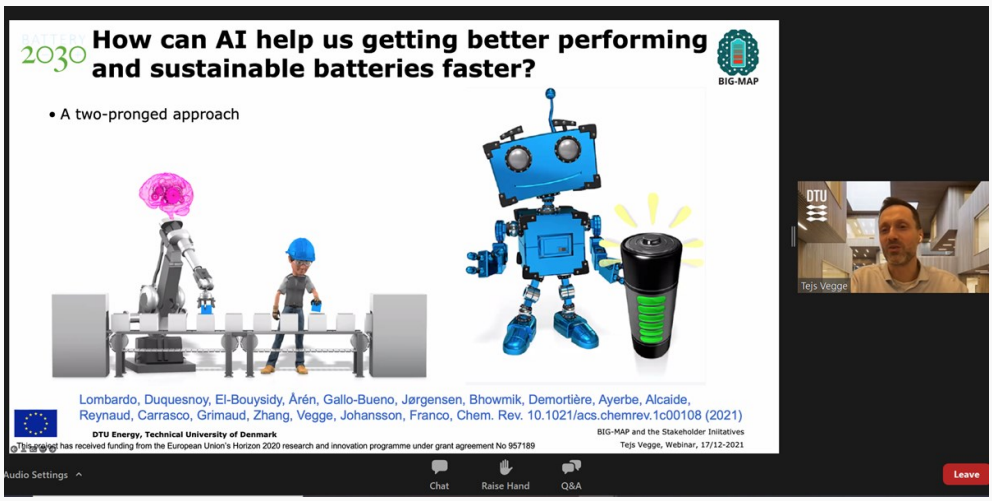
Further down the road the plan is to develop cost-effective battery cell protypes and manufacturing techniques and finally - a real-term validation of self-healing battery prototypes in smart cell phones will be carried out.

Eva Regårdh

Success stories 2021

A few of our projects progress this past year

Spartacus now have its first battery cell equipped with full set of sensors (ultrasonic, temperature and stress sensors) and will extend the sensing devices to the battery management system. **Sensibat** has developed its first functioning built-in sensor; it measures temperature and pressure sensors, but will be extended to other parameters as well. **Bat4ever** has started small scale cell manufacturing for bench-marking purposes with self-healing polymers in LIBs. **Hidden**, utilizing liquid crystalline electrolytes to hinder dendrite growth, has synthesised the 1st generation liquid crystalline electrolyte and demonstrated lab-scale processing.



Funding available

BIG-MAP's second stakeholder meeting

Big-Map had it’s 2’nd stakeholder meeting on December 17th. After presentations of some of the first research achievements within ontology, machine learning, experimental characterization and data management Tejs Vegge, the project coordinator from DTU in Denmark, told us about the possibilities to collaborate and apply for funding.

- We are looking for projects to develop software tools, equipment and approaches to strengthen BIG-MAP and the European battery community, said Tejs Vegge. This is an opportunity to get funding for a smaller project for the Big-Map partners and our stakeholders.

Proposed projects must include at least one Big-Map partner and one external stakeholder. Latest day to apply is February 23 2022. More information on 2nd **Stakeholder Initiative call - BIG-MAP**. Big-Map has an electronic lab-book well under way.

Read our latest news

Keep up to date with the latest news from BATTERY 2030+ and other battery related topics. **Read more...**