Expert Webinar April 14, 2021 10:00 AM – 12:00 PM (CET)

Materials for Hybrid Energy Storage

Creating an Eco-System for Innovation

EERA JP on Energy Storage Expert Webinar

April 14, 2021

TIME (CET)	PROGRAMME
10:00	**Welcome and objectives of the meeting** Myriam Gil Bardají, KIT & EERA JP ES
10:15	**I-Hybrid Energy Storage Systems – Needs for new materials** Magdalena Graczyk-Zajac, EnBW (DE)
10:30	**II- Synchrotrons - A gateway to novel materials and international collaboration** Antje Vollmer, Helmholtz Zentrum Berlin (DE)
10:45	**III- Thinkable pathways for bridging energy materials simulations to synchrotron experiments** Süleyman Er, DIFFER (NL)
11:00	**IV- Cooperation and ways forward – The Clean Energy Transition Partnership** Nikolas Reschen, Federal Ministry Republic of Austria (AT)
11:15	**Round table**
11:45	**Questions from the audience**
12:00	End of meeting

I- Hybrid Energy Storage Systems – needs for new materials

Magdalena Graczyk-Zajac, EnBW (DE)

There is no single energy storage solution that is ideal for every grid-scale application. Usually, an electrochemical energy storage system is designed either for high-power or high-energy applications and if not used in intended ways, the user must cope with penalties by lifetime, performance, and cost. Combining storage components into a complex system allows to benefit on the advantage and to suppress weak points of the components. Hybrid energy storage systems (HESS) refer to several types of storage components of different characteristics that are combined to form an integral entity, preferably controlled by a mutual energy management system.

In this talk, an overview of HESS solutions, offering a short (minutes to weeks) time applications, will be presented in line with approaches aiming longer term (e.g. seasonal) energy storage. This will include the existing systems as well as those under research and development. The necessity to develop novel, sustainable energy storage materials accompanied by progress in setting up innovative hybrid storge systems will also be addressed.

II- Synchrotrons: A gateway to novel materials and international collaboration
Antje Vollmer, Helmholtz Zentrum Berlin (DE)

Multi-disciplinary multi-user facilities, like synchrotrons, offer possibilities ranging from preparation and characterization of materials to multiple spectroscopies, imaging and diffraction methods. Their research portfolio includes physics, chemistry, energy research (e.g., materials for energy conversion and storage, solar fuels, and battery research), biology, medical and pharmaceutical research, materials testing, cultural heritage investigations and more. Addressing the major challenges of humankind today, particularly sustainable energy, climate, and environment, synchrotrons do not only bring together scientists from all over the world, they also foster international cooperation, brain circulation, and multidisciplinary interaction.
In this presentation, examples of breakthrough results in research and development of energy materials for storage shall be discussed as well as the role of synchrotrons as international science hubs. Complex problems can best be attacked by combining comprehensive expertise, different approaches, and complementary techniques, available in the collaboration of large-scale infrastructures with their user communities from academia and industry.

III- Thinkable pathways for bridging energy materials simulations to synchrotron experiments
Süleyman Er, DIFFER (NL)

It is a present-day challenge to design and develop new functional materials for energy applications. Herein, I will summarize two computational projects that aim for the development of *1)* solid-oxide materials for thermocatalytic and *2)* two-dimensional materials for photocatalytic solar fuel generation. In the former project we applied a high-throughput screening methodology that is based on robust physics-based simulations; whereas in the latter we used modern machine learning models to generate and predict the key properties of materials. Common to both projects, large number of materials (100s ~ 100,000s) with new atomic compositions have been systematically generated in computer and their properties have been predicted using application-specific descriptor based approaches. The new information has been used to rank the generated virtual materials in relation to their potential use in two, fundamentally different, energy applications. Nevertheless, in order to truly assess the use of shortlisted candidate materials, in-depth computational and experimental studies will be needed. In this talk, I will therefore also discuss - from a perspective of a computational scientist - the possible use of synchrotron experiments that could enable the acquisition of unique information on the computationally-predicted candidate materials for energy.

IV- Cooperation and ways forward – The Clean Energy Transition Partnership
Nikolas Reschen, Federal Ministry Republic of Austria (AT)

The planned Clean Energy Transition Partnership (CETP) is a multilateral and strategic partnership of national and regional RDI programmes in European Member States and Associated Countries with the aim to contribute substantially to the implementation of the European Strategic Energy Technology Plan (SET Plan).
One of the identified challenges developed by experts within the CETP's Strategic Research and Innovation Agenda (SRIA) is targeted at the development and deployment of energy storage, renewable based fuels, as well as CCU/CCS (Carbon Capture and Use/Carbon Capture and Storage) for a climate-neutral Europe. Storage technologies and solutions need to meet short (seconds and minutes) to medium (intra-day and week) and long term (seasonal) energy storage needs for various energy carriers and provide valuable ancillary services to the energy system. Innovative technologies and solutions for a climate-neutral energy system will play different roles in different regions, offering a wide range of possibilities for their demand-driven deployment.

The identified challenge on storage technologies is suited for transnational programming in Europe and beyond. Responders to calls set up under this challenge are expected to encompass European technology companies and research organisations, builders and operators of European energy infrastructures, original equipment and component manufactures as well as materials suppliers.

Round table participants		
Magdalena Graczyk-Zajac	Project leader R&D Technology Innovation	Energie Baden-Württemberg (DE)
Antje Vollmer	Beamtime Manager	Helmholtz Zentrum Berlin (DE)
Süleyman Er	Research group leader	Dutch Institute for Fundamental Energy Research (NL)
Nikolas Reschen	Policy Officer	Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (AT)
Myriam Gil Bardají	Manager of EERA Joint Programme Energy Storage	Karlsruhe Institute of Technology (DE)
Stefano Passerini	HIU director and coordinator of EERA JP Energy Storage	Helmholtz Institute Ulm at Karlsruhe Institut of Technology (DE)
Holger Ihssen	Brussels Officer	Helmholtz Gemeinschaft (DE)
Olga Suminska-Ebersoldt	Manager of EERA Joint Programme Energy Storage	Helmholtz Institute Ulm at Karlsruhe Institut of Technology (DE)

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