

# The battery hub at ESRF: accelerating and standardizing battery characterization workflows

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The development of high performance, safe and sustainable batteries for e.g. e-mobility, portable and stationary applications, demands overcoming major technological challenges. A more holistic approach is needed to accelerate the discovery of new materials and chemistries, which requires implementing advanced battery characterization in an integrated, automatized and unified manner. In fact, to accelerate our understanding of the variety of processes that dictate battery performance and ageing across an enormous range of relevant time and length-scales, we need to go beyond the traditional single-shot, sophisticated experiment and build centralized experimental frameworks based on multi-modal multi-techniques standardized data acquisition and analysis workflows [1].

To gather forces and efforts, and create impact beyond the usual competition rules and incremental progress, new mechanisms and methods organized into community-unified infrastructures are foreseen. In this spirit, we launched the pilot phase of the Grenoble Battery Hub, a new type of collaborative platform rallying the European battery community and the Large Scale Facilities around central scientific electrochemistry-related topics. This hub is designed to provide new access and cooperation modes, with the objective to accelerate Research & Innovation on batteries by setting an open scientific, technical and communication platform dedicated to promoting, carrying out and analysing cutting-edge neutron and X-ray investigations of battery components and devices. In this talk, we will describe the early stage of operation of the pilot phase started in sept. 2021, and present results obtained at ESRF using an array of techniques (diffraction, scattering, spectroscopy, imaging, tomography) to tackle an array of scientific questions (battery failure, ageing mechanisms, new chemistry reactions) with emphasis on cutting-edge correlative operando experiments conducted on standardized and/or smart batteries. We will discuss how the Hub organization shall go beyond standard collaboration schemes to tackle the challenges related to energy storage, and boost innovation by optimizing research workflow in relation to the European efforts and targets [2].

## References

[1] - Advanced Energy Materials, 2022, 2102694. D. Atkins, [...], S. Lyonnard\*. Accelerating Battery Characterization Using Neutron and Synchrotron Techniques: Toward a Multi-Modal and Multi-Scale Standardized Experimental Workflow. DOI:10.1002/aenm.202102694

[2] - Advanced Energy Materials, 2022, 12, (17), 2102785. Amici, J., [...], Edström, K.\*. A Roadmap for Transforming Research to Invent the Batteries of the Future Designed within the European Large Scale Research Initiative BATTERY 2030+. DOI:10.1002/aenm.202102785