

Master's project/thesis call:

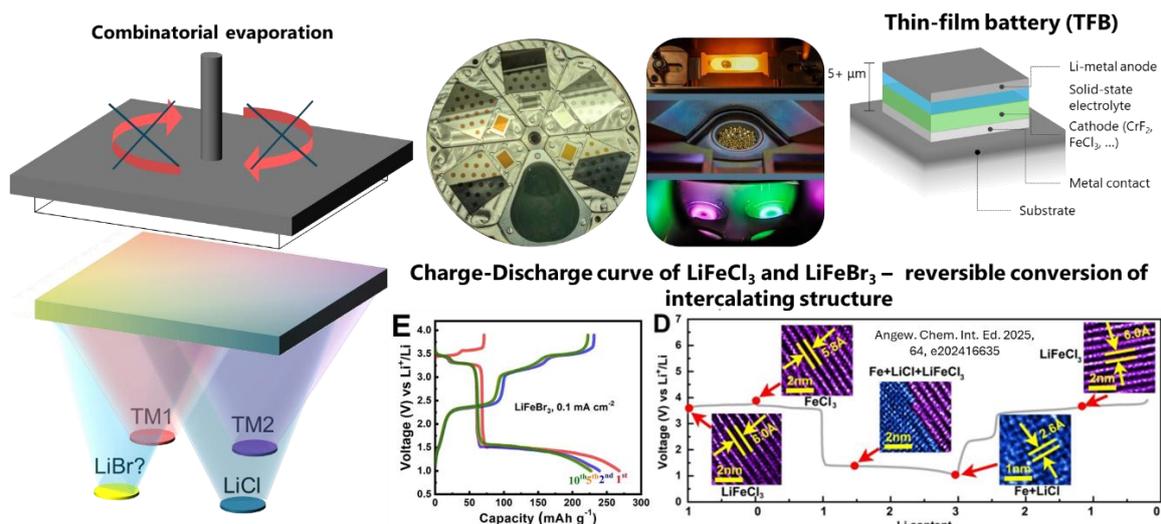
High-throughput combinatorial synthesis of conversion cathodes for thin films solid-state microbatteries

at the Laboratory for Thin Films and Photovoltaics, Empa (Dübendorf, Switzerland)

One of the Laboratory for Thin Films and Photovoltaics' main research topics is solid-state thin-film batteries. We use the advantages of thin-film manufacturing processes to create micro- or nano-scale batteries that can find applications in wireless sensors and consumer electronics, but more importantly, serve as model systems to study the fundamental properties and phenomena governing the performance of specific battery materials and their interfaces.

This project aims to explore the compositional phase space of multi-metal and multi-anion positive electrode (*cathode*) materials belonging to the conversion cathode family, in which Li^+ ions are stored via a chemical reaction with another compound, such as a transition-metal halide salt. This class of materials could prove promising for scaling up cathode thickness due to their intrinsic 2-phase transport properties, but single-metal systems are known for poor kinetics and high overpotentials. You will learn how to fabricate advanced thin films and full devices using physical vapour deposition techniques (evaporation, reactive magnetron sputtering). You will further learn the characterisation techniques required to study morphology (SEM), atomic structure (XRD), chemistry (XRF), and electronic and ionic properties of these materials (EIS, GITT, CV).

This project requires multidisciplinary interests and will help you gather experience in many domains (physical vapour deposition, electrochemistry, materials science, data processing). Therefore, we invite students with a strong background in materials science, chemistry, and/or electrical engineering to apply. It is possible to tailor the project to your specific area of interest and to current developments in the Laboratory. Feel free to contact us for further information.



Duration: 4/6 months

Starting date: Anytime

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Website: <https://www.empa.ch/web/s207/thin-film-batteries>

References: [Tiny robots and sensors need tiny batteries — here's how to do it](#)

[Multi-Electron Transfer Halide Cathode Materials Based on Intercalation-Conversion Reaction](#)