

Master's project/thesis call:

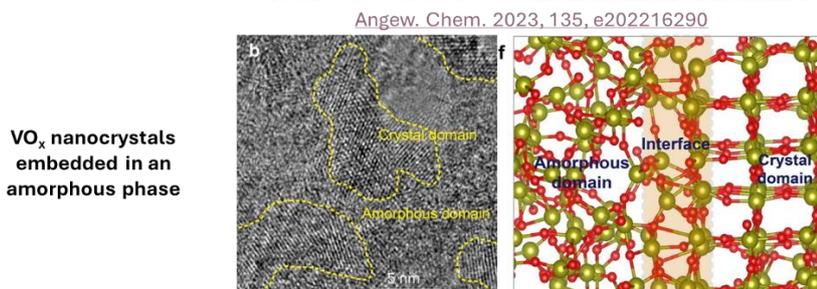
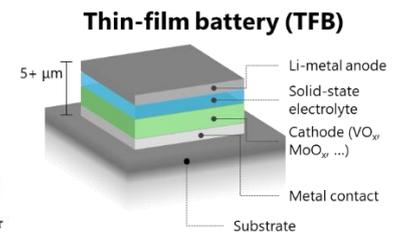
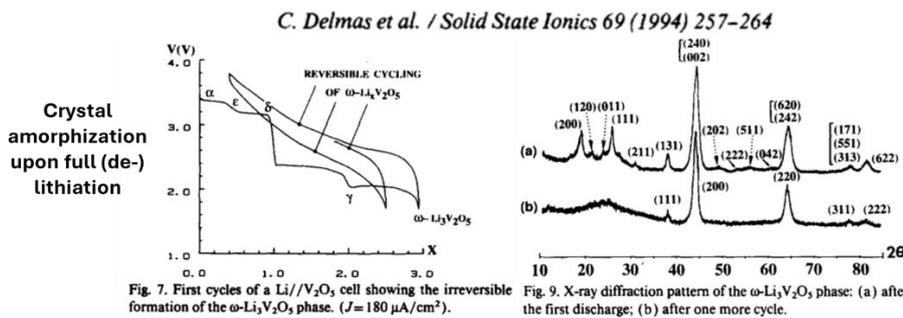
Amorphous cathodes for thin films solid-state microbatteries

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

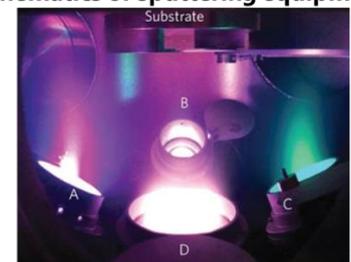
One of the Laboratory for Thin Films and Photovoltaics' main research topics is solid-state thin-film batteries. We use the advantages of thin-film manufacturing processes to create micro- or nano-scale batteries that can find applications in wireless sensors and consumer electronics, but more importantly, 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 positive electrode (*cathode*) materials known for intercalating Li^+ ions into a disordered host structure (e.g., VO_x , MoO_x). This class of materials could prove promising for scaling up cathode thickness and, hence, the energy density of microbatteries, due to their intrinsic non-directional Li^+ diffusion, and hold the potential to enable industrial-relevant processes. You will learn how to fabricate advanced thin films using physical vapour deposition techniques (reactive magnetron sputtering, evaporation) and full devices. 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.



Schematics of sputtering equipment



Duration: 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](#)

[Layered vanadium and molybdenum oxides: batteries and electrochromics](#)