Master thesis

Solid-state lithium-ion microbatteries

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

A thin-film lithium-ion battery is a form of solid-state battery, which combines the advantages of solid-state batteries with the advantages of thin-film manufacturing processes. Thin-film batteries (sometimes called microbatteries) are intended for powering wireless sensors, smart cards, active RFID tags, wearable devices, consumer electronics, etc.

In this master thesis, the student will investigate new architectures and new materials for the development of thin-film batteries with higher power performance or for enabling new applications. Thin-film solid electrolytes with higher ionic conductance can enable faster charge-discharge rates whereas multi-stacking can increase the output voltage of the battery. Low-temperature cathode materials or light-assisted sintering methods can enable the fabrication of microbatteries on temperature sensitive substrates, enabling for example the fabrication of wearable flexible batteries or translucent batteries on glass.

The student will learn to fabricate thin-film solid-state batteries using a variety of deposition techniques (sputtering, thermal evaporation, atomic layer deposition, etc.) as well as the characterization techniques required to investigate such devices.

The field of battery research requires a multidisciplinary knowledge. Hence, students with backgrounds in materials science, electrical engineering, process engineering, chemistry or physics are welcome to apply. The project can be tailored to the field of studies and interests.

**Duration:** 4-6 months

**Starting date:** At any time

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