Interfaces in batteries, a hot topic for the long-term large-scale research initiative in Europe

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Abstract: There are many complex reactions taking place at interfaces in batteries in general and in lithium (LIB) and sodium-ion batteries (SIB) in particular. Some of these are unique for each battery type. For SIBs there are similar reactions taking place as in LIBs.

In this presentation, investigations of the electrolyte/electrode interface, including the solid-electrolyte interphase (SEI) on the anode and the cathode electrolyte interface (CEI) on the cathode, will be discussed. The discussion will be based on the spectroscopy, such as hard X-ray Photoelectron Spectroscopy (HAXPES) and ambient pressure PES, in order to elucidate the chemical composition as a function of depth profiling of the interfaces. A special focus is how interfaces are influenced by electrochemical cycling and how this influence the performance of the respective typ of battery. We have investigated different categories of electrode materials: i.e. conversion, alloying, and insertion anodes as well as metal-oxide and phosphate cathodes. This presentation will describe how the methodology of the experiments has improved and how we start to be able to look at dynamic properties due to the development of ambient pressure PES [1,2,3].

To understand and control interfacial reactions in batteries is one of the most important long-term issues to address, as defined by European battery-research community in the large-scale research initiative BATTERY 2030+ [4]. It is one of the most important obstacles to solve when it comes to make the ultra-high performance batteries of the future. If safe batteries with higher energy and/or power with a lifetime longer than 10 years could be made, it would be beneficial for a fossil-free society with a sustainable transport sector.

Key words: interface, SEI, battery, BATTERY 2030+, battery life-time

References

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