Batterien und Mobilität: Von der Grundlagenforschung zum Industrieprodukt

Prof. Dr. Petr Novák

Paul Scherrer Institut, Labor für Elektrochemie, CH-5232 Villigen PSI
petr.novak@psi.ch; novakp@ethz.ch

The long-term safeguarding of both the individual mobility and the commercial transportation sector requires highly efficient vehicles which are ideally powered by energy from renewable sources, supplied and delivered in an economical way. Electric propulsion systems offer large potentials for decreasing the dependence on crude oil as well as for the reduction of CO_2 release into the atmosphere and the local emissions of pollutants. Plug-in hybrids and battery-based electric vehicles gain interest as an interesting option for gasoline substitution and reduction of CO_2 emissions. The high energy density available from lithium-ion batteries is the reason for their key importance in this sector.

In lithium-ion batteries both the negative and positive electrodes are made from electronically conductive matrix materials which are able to reversibly accommodate (insert) variable quantities of lithium ions. So far, electroactive insertion materials used in commercial lithium-ion cells are based on lithiated carbon (LiC_6) and lithium transition metal oxide $LiMO_2$, typically on the basis of cobalt, nickel, and manganese. In the talk the underlying scientific questions will be discussed, strongly related to the development and application of advanced *in situ* analytical methods to the characterization of components of lithium-ion batteries. The challenge here is the understanding of how the structure and composition of battery materials are correlated with their electrochemical properties, in particular with their specific charge, cycling stability, and rate and mechanism of side reactions.