

## THE SOLID ELECTROLYTE INTERPHASE (SEI) IN RECHARGEABLE LITHIUM BATTERIES: ABOUT UNDERSTANDING AND MISUNDERSTANDING

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### Abstract

Rechargeable lithium ion cells operate beyond the thermodynamic stability window of the organic electrolytes. Electrolyte decomposition takes place at the electrode/electrolyte interface and the decomposition products build up a layer that is permeable for lithium ions but protect the electrolyte compounds from further reduction. This concept is being referred to as Solid Electrolyte Interphase (SEI) formation [1]. The SEI concept was introduced for lithium metal [1-3] and has later been adapted to carbonaceous anode materials [2, 4]. However, with alternative metallic anodes becoming increasingly popular, it is important to discuss their SEI filming behaviour in liquid organic electrolytes and emphasize the differences and similarities to carbonaceous and lithium metal anodes, too. An overview about more than 10 years of R&D activities on SEI research at Graz University Technology is presented. The different requirements on the electrolyte and on the SEI formation process in the presence of various anode materials (metallic lithium, graphitic carbons, and lithium storage metals/alloys are highlighted. Problems with SEI analysis and understanding are particularly addressed.

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### References

1. E. Peled, in: *Lithium Batteries* (J.-P. Gabano, Ed.), Academic Press, London 1983, Ch. 3.
2. M. Winter, K.C. Moeller, J.O. Besenhard, in: *Science and Technology of Advanced Lithium Batteries* (G. A. Nazri, G. Pistioa, eds.), Kluwer, in press.
3. A. N. Dey: Electrochem. Soc. Fall Meeting 1970, Abstr. 62.
4. R. Fong, U. von Sacken, J.R. Dahn: J. Electrochem. Soc. **137** (1990) 2009.

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