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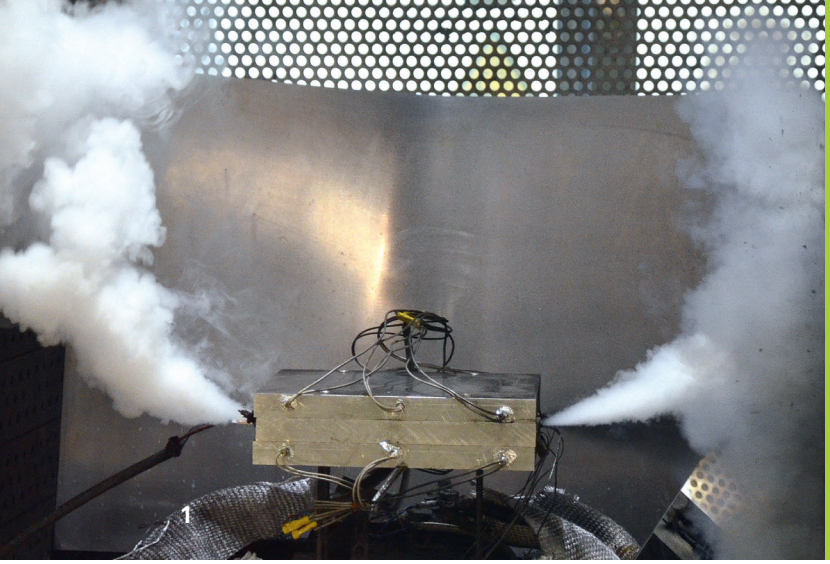
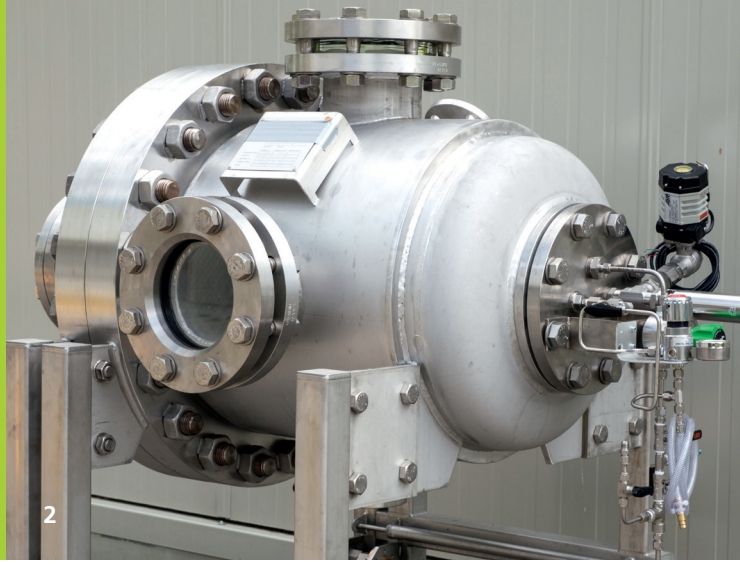
FRAUNHOFER INSTITUTE FOR CHEMICAL TECHNOLOGY ICT

APPLIED ELECTROCHEMISTRY – BATTERY ANALYSIS





BATTERY ANALYSIS

The increased use of rechargeable lithium-ion accumulators (Li-ion-batteries) in our time is clearly visible in the increasing numbers of electric vehicles on our roads such as electric cars, hybrid cars or e-bikes. Li-ion batteries are also used in an increasing number of other everyday objects because they have a high energy density and cycle stability.

The cell chemistry of Li-ion batteries is very different from conventional batteries such as nickel-cadmium (NiCd) or nickel metal hydride (NiMH), which sets them apart from the current batteries in terms of their potential risk deriving from incorrect use, accidents, or failure of the battery management system. In addition to the different cell chemistry, this potential hazard is also influenced by the size and number of the built-up cells. In battery safety research, the focus of publicly funded research projects especially lies on electromobility, since a large number of cells are needed for every electric car – which means that the potential risk is high. But even with electrical devices that are much smaller and have only one or very few Li-ion batteries, manufacturers are well advised to think about the potential risk during use and their disposal before the market launch or switching to Li-ion batteries.

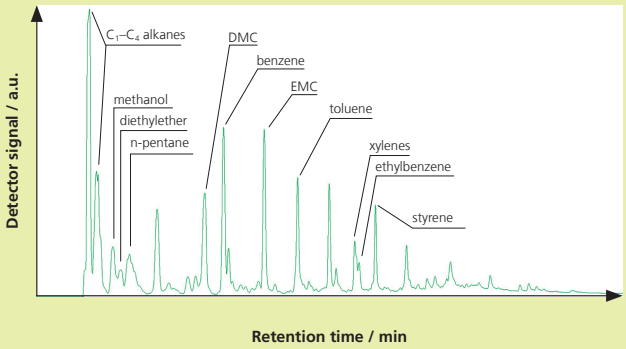
For many years, researches at the Fraunhofer ICT have been developing rechargeable energy systems – such as, for example, Li-ion systems with different cell chemistries. Recently a state-of-the-art battery testing plant has been added to the existing facilities, where it is now possible to conduct various abuse tests on batteries without endangering humans or the environment. In addition to standard testing methods, it is also possible to carry out investigations according to customer demands.

Our mission

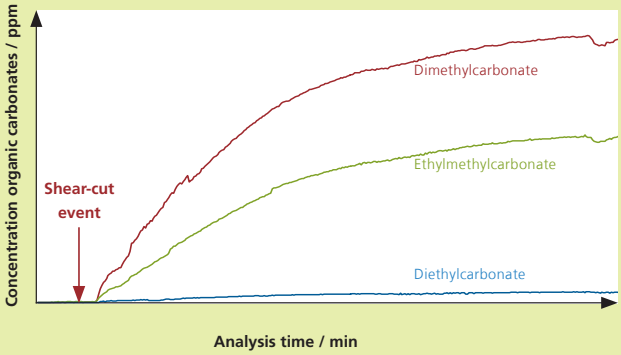
Besides purely mechanical, electrical and physical examinations, the Fraunhofer ICT also offers a broad range of chemical analysis of the gases released in the tests as well as analysis of residue samples. In addition to measuring the amount of released gas, it is also possible to measure its chemical composition. This can either be conducted summarily – usually after the experiment – or in a temporally resolved manner during the experiment. In this way, even very reactive substances and possible intermediates, which might be particularly relevant for a safety reassessment due to their potential hazards, can be detected.

1 *Emission of electrolyte gas (venting) during thermal abusetest of a Li-ion pouch cell.*
2 *Safety pressure vessel with temperature control for abuse tests with various sensor and analysis options.*

Detection of organic trace components in the exhaust gases of a battery test using chromatography.



Time-resolved gas analysis exemplified by organic carbonates released after a cell shear test.



Possible investigations range from the detection of trace substances to the measurement of main components. These methods can be tailored to the requirements or wishes of the customer and will be continuously developed and adapted.

Furthermore the expertise and the facilities for post-mortem analysis available at the Fraunhofer ICT make it possible to analyze damages on or caused by Li-ion batteries. In addition, so-called worst-case scenarios for the use of Li-ion batteries in new or modified products can be investigated. The spectrum ranges from small, electric domestic appliances and power tools though to the accompanying analysis of electric vehicle crashes.

Our offer

Every customer is different – we are happy to help you whenever you need our help. We combine your knowledge and experience with our facilities and know-how so that we can assist you in answering any open questions. Our customers range from cell manufacturers and users of Li-ion batteries in small electrical devices through to manufacturers of electric vehicles as well as other sectors related to the use and transport of Li-ion batteries.

In addition to simple standardized testing, we also offer a special experimental testing program tailored to your needs, a literature research, a post-mortem investigation on a case of damage or an on-site analysis. Our priority is to help you find a solution to your problem, not selling you single services. Satisfied customers, who are not left alone with nothing but a measured value, are what make us special.

An overview of what we offer you:

- Individual consultation and formulation of a set of recommendations
- Market studies and screening
- Standardized and customized tests with and without gas analytics
- Customer-specific on-site analytics or sampling of battery gases, residues, etc.

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BATTERY ANALYSIS

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