sensibat

NEWSLETTER SPRING 2022

SENSIBAT started 2022 well:

After 18 months of work, we have reached the halfway point of the project, and thanks to the work of all partners we are obtaining the major results in the form of integrated sensors in li-ion cells. The SENSIBAT project faces the coming months full of challenges with energy.

We made important steps in the development and implementation of pressure and temperature sensors in battery cells

We organised a battery Zeroing Course with over 240 attendees

We had a very informative Advisory Board workshop

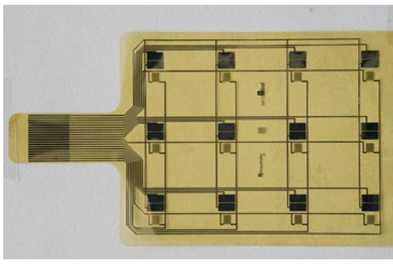
Report on adaptation of temperature and pressuresensors for incorporation into battery cells

SENSIBAT develops two types of sensors for derivation of the parameters temperature and pressure in situ, i.e. inside the battery cells. The SENSIBAT-sensors use proven sensing principles which will be adapted and arranged in a matrix style that allows the read out with spatial resolution. Resistive temperature sensors and parallel-plate capacitors based on pressure-sensitive insulators have been under investigation.

For temperature sensors three thin-film metals were analysed of which platinum and a nickel-aluminium alloy gave the best performance with respect to temperature sensitivity, linearity and hysteresis. Out of a variety of polymeric materials, polyurethane yields sufficient mechanical and electrical responses for integration with the pressure sensors.

The addressing scheme matching the components was jointly set up with SENSIBAT partners responsible for the battery management electronics. Aiming at a reduction of the number of wiring lines, the temperature. sensors will be read out in a cross-point arrangement whereas the capacitive sensors use a common ground/common rail approach.

Read more about the sensor adaption here

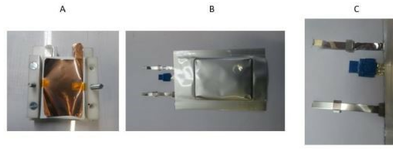


In the figure above you can see the SENSIBAT Level 1 sensor matrix designed for 1 Ah battery cells before encapsulation. The matrix holds 12 resistive temperature sensors for cross-point array addressing as well as 12 capacitive pressure sensors in common rail configuration.

Report on prototyping 1Ah cells with integrated sensors matrix

Within SENSIBAT, also research has been performed for the integration of the developed internal temperature and pressure sensor within a Li-ion cell in pouch format . This includes looking at influence of sensor matrix on cell performance and influence of cell environment (electrolyte) on sensor stability. Initial results show that there is no influence of the integrated sensors on the electrical performance of the cells. In the following months this will be analysed in greater detail with prolonged degradation tests included.

Adequate encapsulation of sensitive (metallic) structures of the sensor against the aggressive electrolyte environment is shown to be essential to ensure sensor stability and functionality. Encapsulation therefore has been studied, showing that the encapsulation scheme for the matrices must include a high temperature annealing step (120°C to 200°C for 1 day) in oxygen-free atmosphere. Unfortunately, the chosen material PU does not withstand temperatures above 100°C for longer times. Thus, the materials for the compressible insulator had to be revised. Polysilanes and polysiloxanes were identified as stable replacement offering sufficient electrical and mechanical properties.



In the figure above you can see the electrode stack during construction at VARTA (**A**), Finished cell with embedded sensor dummy (**B**), feedthrough area (**C**).

Zeroing Course 2022

In the frame of the SENSIBAT-project and the BATTERY2030+ cluster we held a webinar "the Zeroing course".
The Zeroing course took place on the 7th and 8th of March and provided the basics on Li-ion batteries, including:

- Ageing processes
- Battery states (e.g. SOC, SOP), their modelling and implementing these models in the BMS
- Measuring battery states with sensors.

The full recordings can be found on our SENSIBAT website here.

Battery 2030+ Initiative

BATTERY 2030+

BATTERY 2030+ is a large scale, long-term European research initiative in which SENSIBAT is included. The vision of BATTERY 2030+ is to invent the sustainable batteries of the future. This will provide European industry with disruptive technologies and a competitive edge throughout the entire battery value chain and enable Europe to reach the goals of a climate-neutral society envisaged in the European Green Deal. Visit the new website here

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement no. 957273. This newsletter only reflects the authors' view and the European Commission is not responsible for any use that may be made of the information it contains.

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