EU Project
NanoBat

A nano-tech solution to optimize battery testing for cost- and time-efficient production applied to the automotive industry

H2020 financed project
April 2020 - March 2023
Coordinator: Keysight Technologies

Battery production for clean energy, waste and CO₂ reduction

Cost efficiency and large scale production

EU "Industrial Policy Strategy" for efficient battery production

EU battery market demands at least 20 Giga-Factories

Battery market potential of € 250 billion/year after 2025
Summary

- Nanoscale imaging of battery surfaces
- High frequency techniques, up to GHz
- Advanced studies for battery measurements
- Tests in pilot lines and automotive batteries
- Higher efficiency in battery production

Objectives

Science & Technology

- Impedance spectroscopy (EIS)
- Self discharge current
- GHz & electrochemical microscopy
- Dielectric resonators & scanners for energy materials

Calibration, Modelling & Data Analytics

- Nonlinear & physical models
- Advanced impedance calibration & standards
- Automated battery classification in pilot lines
- GHz materials testing

Industry & Open Innovation

- Battery manufacturing pilot lines
- New GHz materials instruments & demos
- Public outreach events
- Standardization documents for materials & modelling

Value Chain

<table>
<thead>
<tr>
<th>Technology Development</th>
<th>Product Development</th>
<th>Validation</th>
<th>Demonstration</th>
<th>Standardization Exploitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-line electrical tests</td>
<td>Cell &amp; Module Testers</td>
<td>Metrology &amp; Validation of tests in pilot lines</td>
<td>Hardware &amp; Software demonstrator</td>
<td>Standardized accurate and reliable data and models</td>
</tr>
<tr>
<td>Bulk scale, micro- and nano-scale</td>
<td>Material Scanners</td>
<td></td>
<td>Nanoscale electro-chemical models</td>
<td></td>
</tr>
</tbody>
</table>

**Modelling and Open Platform** (battery models and open platform simulation tools)

**Metrology, Open Innovation, Standards and Calibration**

**Dissemination, Stakeholder Group** (creating visibility and outreach)
Key Actions

Nanoscale SEI (solid electrolyte interface) for battery test in pilot lines

High-Impact scientific articles on battery SEI performance and modelling

Pilot line quality gates based on cyber-physical system and data driven models with machine learning

A public e-car rally organized by Kreisel under supervision of FIA with battery modules tested by NanoBat

Key Technologies

EIS

Metrology graded and calibrated in-line electrochemical impedance spectroscopy (EIS)

SDM

New self-discharge measurement (SDM) that eliminates weeks of cell storage time required to discern good versus bad cells in battery manufacturing

High throughput pilot line

- Multi-scale high-frequency toolbox tested for pilot line quality control
- Real-time EIS integrated in pilot lines and high throughput quality test
- 30,000 cells/day are tested for automotive applications

RF-nanoscale broadband techniques

New nanoscale broadband GHz techniques to measure local SEI electrochemical activity and impedance changes, at large electrical bandwidth (milli Hz to Giga Hz), high temporal (<1 nano-second) and lateral (1-20 nano-meter) resolutions

Software

Teaching kits, open software, and data analytics packages are provided including multi-physics models of battery surfaces and nanoscale processes
Facts

- Call: H2020-NMBP-TO-IND-2019
- Activity: DT-NMBP-08-2019
- Work Programme: Real-time nano-characterisation technologies (RIA)
- Grant Agreement No.: 861962
- Proposal Acronym: NanoBat
- Start Date: 1st April 2020
- Duration: 36 months
- Total Grant: 4,966,912.5 €

Partners

- Industry: Keysight (AT) - Coordinator
- SMEs: QWED (PL), PLEIONE-ENERGY (GR), KREISEL (AT), EURICE (DE)
- R&E: JKU (AT), TUBS (DE), RUB (DE)
- RTOs: METAS (CH), IMDEA-ENERGY (ES), AIT (AT), CRF (IT)

Contacts

Coordinator:
Keysight Technologies GmbH
Technical Lead: Ferry Kienberger
ferry_kienberger@keysight.com
Office: Gerald Kada
gerald.kada@keysight.com

Management: Eurice GmbH
Contact: Janine Jost
j.jost@eurice.eu

Website: www.nanobat.eu

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