



Joint MetSuperCap - EMPHASIS Workshop

June 12, 2024

(After online registration, the login details will be provided to the registrants)

The aim of this workshop, organized on the occasion of the 2nd Progress Meeting of the EMPHASIS project and the Kick-off meeting of the MetSuperCap project, is to provide a broad overview of the supercapacitor technology and testing, along with related applications.

Join us for a workshop covering many aspects of the supercapacitor technology and applications. Fourteen pitch talks which show the supercapacitor technology, testing and applications, ranging from e-mobility to textiles.

MetSuperCap: Metrology for static and dynamic characterization of supercapacitors

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EMPHASIS: Efficient materials and processes for high-energy supercapacitors for smart textiles and electromobility applications

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Technical program and chairs

Mauro Zucca - Istituto Nazionale di Ricerca Metrologica (INRIM)

Athanasios Masouras - Pleione Energy S.A. (PLEIONE)

The workshop is free of charge.

If you are interested, please register on the [EMPHASIS website](https://www.emphasis-supercaps.eu/).

| AGENDA | | |
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| 9:00 – 9:15 | Online Registration | |
| 9:15- 09:25 | Welcome note | Pietro Asinari (INRIM Scientific Director) |
| Projects | | |
| 09:25 – 09:40 | MetSuperCap: Metrology for static and dynamic characterization of Supercapacitors | Mauro Zucca (INRIM) |
| 09:40 – 09:55 | EMPHASIS: Efficient materials and processes for high-energy supercapacitors for smart textiles and electromobility applications | Athanasios Masouras (<i>Pleione Energy S.A.</i>) |
| Batteries and supercapacitors | | |
| 09:55 – 10:05 | Reliable battery and supercapacitor testing: the use of EIS and ML methods for ECM parametrization and SOH determination | Gert Rietveld (<i>Twente University</i>) |
| 10:05 - 10:15 | Differences and similarities of supercapacitors and li-ion batteries | Lars Fast (<i>RISE Research Institutes of Sweden AB</i>) |
| 10:15 - 10:20 | Q&A session | |
| Supercapacitors Testing | | |
| 10:20 – 10:30 | Optimizing Measurement Uncertainty and Confidence Levels in Calibrated Supercapacitor and Battery EIS Testing | Nawfal Al-Zubaidi R-Smith (<i>Keysight Technologies GmbH Austria</i>) |
| 10:30 - 10:40 | Transients testing methodology for supercapacitor measurement. | Mohamed Ouameur (<i>LNE Laboratoire national de métrologie d'essais</i>) |
| 10:40 - 10:45 | Q&A session | |
| 10:45 - 11:00 | Coffee break | |
| Applications | | |
| 11:00 – 11:10 | Overview of Supercapacitor-Battery Hybrid Storage System Applications | Salvatore Musumeci (<i>Politecnico di Torino</i>) |
| 11:10 – 11: 20 | How SuperCaps can improve the world of Smart Textiles | Michael Schneider (<i>BORN GmbH</i>) |
| 11:20 – 11:30 | Structural and solid-state supercapacitors and their applications in automotive and aerospace | Bruno Grandinetti (<i>NOVAC srl</i>) |
| 11: 30 – 11:40 | Overview of supercapacitors possible applications for automotive hybridization | Riccardo Rocca (<i>CRF Centro Ricerche Fiat - Stellantis</i>) |

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| 11:40 - 11:50 | Q&A session | |
| LCA and aging | | |
| 11:50 - 12:00 | Life Cycle Sustainability Assessment – Support for sustainable innovations | Daniela Groß-Fürtner & Hanna Sofia Leiter (<i>WOOD K Plus</i>) |
| 12:00 – 12:10 | Aging factors and influence quantities for energy storage devices in power applications | Andrea Mariscotti (<i>Università di Genova</i>) |
| 12:10 - 12:15 | Q&A session | |
| Stakeholder session | | |
| 12:15 – 12:25 | Jason Lee, Eaton Global Product Manager | |
| 12:25 - 12:35 | Kristijan Cizmar, Head of Energy Systems, TÜV SÜD Product Service GmbH | |
| 12:35 - 12:45 | Q&A session | |
| Round table session | | |
| 12:45 - 12:50 | <i>Participants gather at the round table</i> | |
| 12: 50 – 13:20 | Round table <i>Moderators: Lars Fast and Nawfal Al-Zubaidi R-Smith</i> | |
| 13:20 | Workshop end | |

Abstracts

- **Projects**

- **9:25 – 09:40 MetSuperCap: Metrology for static and dynamic characterization of supercapacitors (Mauro Zucca)**

MetSuperCap aims at establishing a traceable and sound measurement and characterization framework for both supercapacitors (SCs) and SCs banks. Determination of SoC/SoH of SCs, the assessment of ECMs parameters, the behavior in operation, are also considered.

- **09:40 – 09:55 EMPHASIS: Efficient materials and processes for high-energy supercapacitors for smart textiles and electromobility applications (Athanasios Masouras)**

EMPHASIS focuses on developing novel materials for supercapacitors derived from natural resources, improving design processes and advancing design architectures for energy storage solutions in the fields of electromobility and smart clothing.

- **Batteries and supercapacitors**

- **09:55 – 10:05 Reliable battery and supercapacitor testing: the use of EIS and ML methods for ECM parametrization and SOH determination (Gert Rietveld)**

Electrical impedance spectroscopy (EIS) is an excellent method to determine the equivalent circuit parameters reflecting the physical processes in batteries and SCs. Machine learning methods for EIS feature extraction and correlation analysis can provide predictions of SOH.

- **10:05 - 10:15 Differences and similarities of supercapacitors and li-ion batteries (Lars Fast)**

A comparison of electrical and physical properties of supercapacitors and batteries presented as simple examples to emphasize their complementary properties.

- **Supercapacitors Testing**

- **10:20 – 10:30 Optimizing Measurement Uncertainty and Confidence Levels in Calibrated Supercapacitor and Battery EIS Testing (Nawfal Al-Zubaidi R-Smith)**

Advancing Quantitative Uncertainty and Error Propagation Analysis in EIS Experiments for Supercapacitors and Batteries. Our objective is to pinpoint measurement uncertainties and error sources, assessing their impact on impedance measurements.

- **10:30 - 10:40 Transients testing methodology for supercapacitor measurement (Mohamed Ouameur)**

The method of transient analysis can be described as pseudo-stationary since we start from an initial equilibrium state to obtain another equilibrium state. This method analyses the current response to a voltage step between 80 mV and 5 mV, depending on the voltage range.

- **Applications**

- **11:00 – 11:10 Overview of Supercapacitor-Battery Hybrid Storage System Applications (Salvatore Musumeci)**

In renewable energy production, the intermittent nature of the energy makes hybrid storage systems quite interesting. The main issues and advantages of using supercapacitors in hybrid energy storage systems interfaced with renewable energy sources are briefly presented.

- **11:10 – 11: 20 How SuperCaps can improve the world of Smart Textiles (Michael Schneider).**

The market for smart and e-textiles is growing steadily. In addition to the textile component, electronics and, above all, energy supply play a major role here. Supercaps help to improve the application and user experience. Find out how in this presentation.

- **11:20 – 11:30 Structural and solid-state supercapacitors and their applications in automotive and aerospace (Bruno Grandinetti)**

Structural supercapacitors (SCs) are a cutting-edge technology for the integration of supercapacitors in different use cases in which weight and volume represent a strong constraint.

- **11: 30 – 11:40 Overview of supercapacitors possible applications for automotive hybridization (Riccardo Rocca)**

Comprehensive overview of SC applications in the automotive field. SC coupled in strong cooperation with both Fuel Cells and Batteries (EVs) could enhance performances and vehicle lifespan. In hybrid applications, these devices cover the role of energy reserve that can provide a boost when the vehicle is in need.

- **LCA and aging**

- **11:50 – 12:00 Life Cycle Sustainability Assessment – Support for sustainable innovations (Daniela Groß-Fürtner & Hanna Sofia Leiter)**

An implemented eco-design approach with environmental, social and economic sustainability assessment to anticipate potential impacts in accordance with supercapacitor development will help to achieve sustainability by design – a first insight.

- **12:00 – 12:10 Aging factors and influence quantities for energy storage devices in power applications (Andrea Mariscotti)**

Aging factors have the meaning of quantities that favor or accelerate aging; the quantification of such aging may be related instead to “aging indexes”, which quantify aging, defining it as a reduction of stored charge, an increase of internal resistance and so forth.