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Paving the Way for a Renewable-Powered Future: New EU Research Project EMPHASIS to Develop Novel Supercapacitors

A cutting-edge energy storage system to meet increasing global energy demands

13 February 2023 – Fast depleting global fossil fuel reserves and steeply rising greenhouse gas emissions have caused serious concerns over the past decade. More environmentally friendly, efficient and cost-effective energy conversion and storage technologies are needed urgently. In this regard, supercapacitors have shown great promise. The European research project EMPHASIS aims to develop next-generation supercapacitors (SCs) optimised for consumer use, such as electromobility and smart clothing. The project's innovative approach will focus on developing novel materials derived from natural resources, improving design processes and advancing design architectures for energy storage solutions beyond the technical status quo. Over the next three years, EMPHASIS partners will receive EUR 5,4 million in funding from the European Commission's Horizon Europe programme.

The sustainable, climate-neutral storage of large amounts of energy is among this century's main challenges. While today's energy conversion technologies are already mainly renewable-based, such as solar (photovoltaics), wind (turbines) and marine (wave/tidal), the development of high-performance energy storage systems following circular economy standards and using green materials is lagging. This is where EMPHASIS aims to leave its mark.

Breakthrough Energy Solutions for a Low-Carbon Future

EMPHASIS will pursue sustainable energy storage solutions in two areas that are paramount to cover the needs demanded by our modern lifestyle: electromobility and the emerging field of smart clothing. While both areas are particularly fast-growing, they are riddled with several inherent difficulties.

The Li-ion batteries currently used in electric vehicles face many drawbacks, such as increasing costs, scarcity of raw materials and a negative environmental impact. The innovative EMPHASIS approach using SCs based on biomass-derived materials (BDMs) will be a promising alternative by offering enhanced performance, biodegradability and cyclability.

Wearable smart garments can assist users in maintaining their health and well-being. A key issue, however, is the comfort and security concerns stemming from using voluminous batteries. The



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smaller-sized SC technology proposed by EMPHASIS would increase clothing comfort and provide better medical treatment quality to users overall.

“EMPHASIS aspires to reach the technical and economic targets of the [European Commission’s SET plan](#) for 2030. By focusing on defining and generating a credible approach for next-generation supercapacitors using ‘green’ materials, we can boost the transition towards a novel climate-neutral energy system. Our goal is to make great strides at all levels of the design process, which will provide viable solutions for high-energy/high-power density and safe storage devices,” says project coordinator Dr Antonios Vavouliotis from Greece-based company Pleione Energy S.A.

Rising to the Challenge

To reach this ambitious goal, the focus of the EMPHASIS research teams will be on designing and developing (1) novel and green materials, (2), cost-effective and sustainable processes, and (3) an advanced device architecture.

“In detail, we will adopt a systematic approach in EMPHASIS, which encompasses the simultaneous optimisation and design of the essential components of the SC device, i.e., electrode materials and electrode morphology, electrolyte composition for best operation conditions, and current collector. This will maximise device performance and long-term stability,” adds Dr Vavouliotis.

The highly inter- and cross-disciplinary EMPHASIS consortium comprises 13 academic and industrial partners from five countries. The project officially kicks off its activities with a face-to-face meeting on 13 and 14 February 2023.

KEY FACTS

Full name: EMPHASIS – Efficient materials and processes for high-energy supercapacitors for smart textiles and electromobility applications
Start date: 1 January 2023
Duration: 36 months
Budget: EUR 5,4 Mio
Coordinator: Pleione Energy S.A.
Website: <https://www.emphasis-supercaps.eu>



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PROJECT PARTNERS

AUSTRIA

- Keysight technologies GmbH
- Wood K plus

FRANCE

- The new Aquitaine Composites & Advanced Materials Technology Center
- Solvionic

GERMANY

- Born GmbH
- European Research and Project Office GmbH
- Fraunhofer Institute for Integrated Systems and Device Technology
- University of Würzburg

GREECE

- Foundation for Research and Technology Hellas
- Pleione Energy SA (*project coordinator*)

ITALY

- Centro Ricerche Fiat / Stellantis
- Italian National Institute of Metrological Research
- University of Torino

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