



# The SOLiD Project

HORIZON-CL5-2021-D2-01-05



**Funded by  
the European Union**

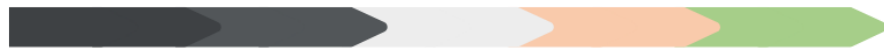
## Project Information

# SOLiD

Grant Agreement number: 101069505

Start Date  
1 September 2022

End Date  
1 September 2026



Total Budget  
€ 7,026,001

Coordinated By  
TEKNOLOGIAN TUTKIMUSKESKUS VTT OY  
FINLAND



## Project Data Sheet

Sustainable manufacturing and optimized materials and interfaces for lithium metal batteries with digital quality control

Grant Agreement number: 101069505

Starting date: 1/9/2022

Duration: 48 months

Total budget: 7,026,001 EUR

Project website: [www.thesolidproject.eu](http://www.thesolidproject.eu)

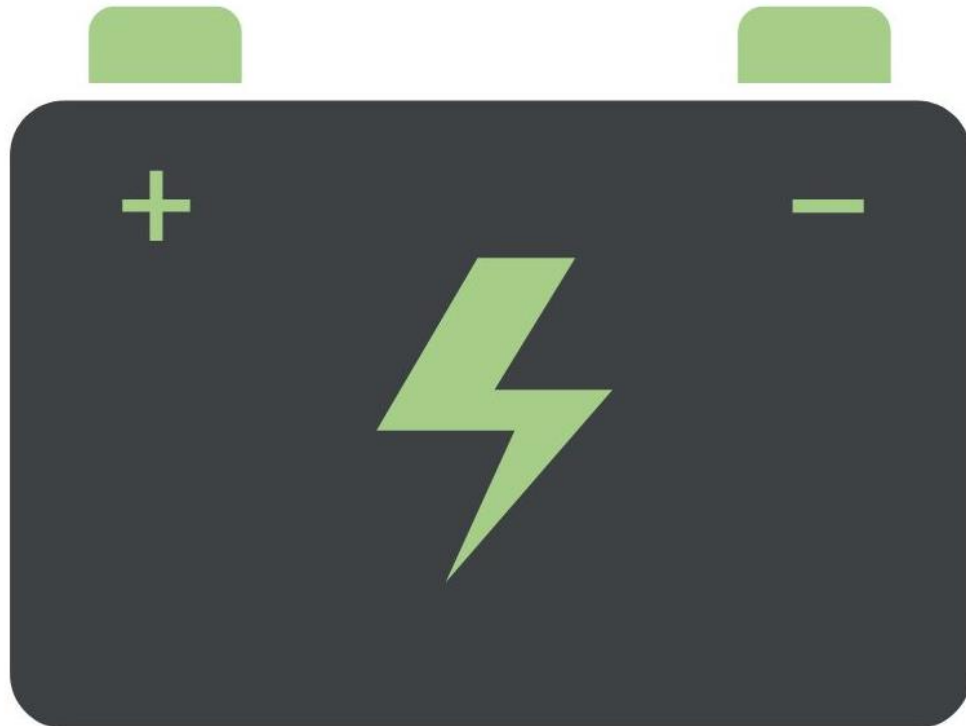
Twitter account: [www.twitter.com/SOLiDProjectEU](https://www.twitter.com/SOLiDProjectEU)

LinkedIn account: [www.linkedin.com/showcase/SOLiDProjectEU](https://www.linkedin.com/showcase/SOLiDProjectEU)

Cordis page: [www.cordis.europa.eu/project/id/101069505](http://www.cordis.europa.eu/project/id/101069505)



# THE CHALLENGE

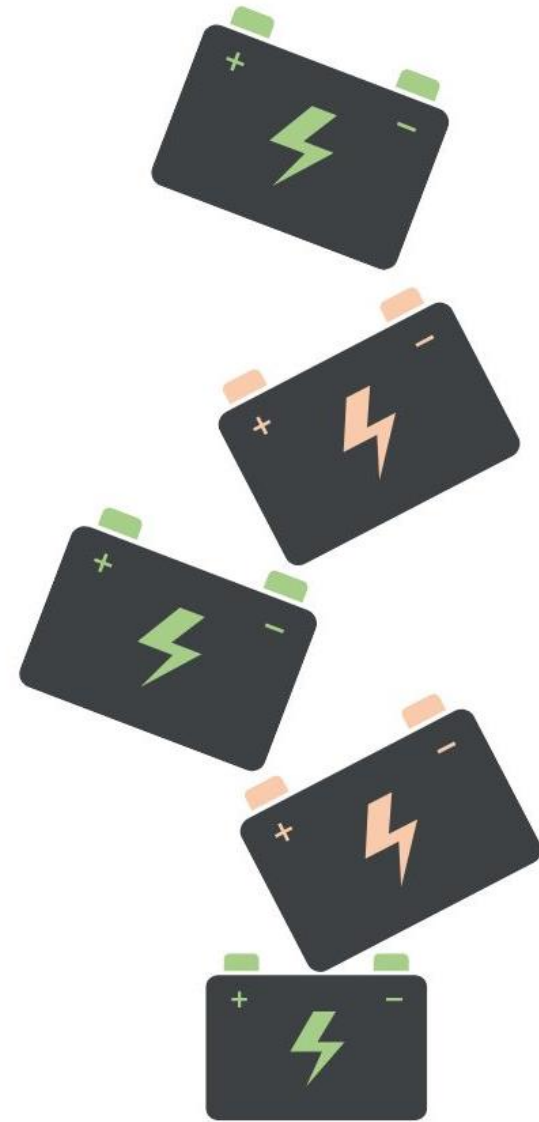


Sustainable manufacturing of Gen. 4b solid-state batteries with minimised amount of critical raw materials (Co and Li), and with superior performance and safety is a major challenge in today's battery research. Lithium-ion battery cells with conventional active materials are reaching their limits in terms of energy densities. Also, safety issues arise with the use of liquid organic electrolyte which are becoming even more critical with the introduction of advanced materials made to increase cell voltage and fast charging rates. Hence, there is an urgent need for the development of innovative scalable manufacturing technologies based on new solid-state electrolytes that can be also combined with metallic lithium at the anode, leading to significantly enhanced energy density.

# THE PROJECT

The SOLiD project aims to create a sustainable and cost-efficient pilot scale manufacturing process for a high energy density, safe and easily recyclable solid-state Li-metal battery. The project will develop a scalable process for each of the cell layers and interlayers and demonstrate the cell manufacturing and assembly in pilot and industrial scale.

The SOLiD project aims at creating sustainable production for solid-state electric vehicles batteries, contributing directly to the environmental objective of climate change mitigation. In addition, the project supports the objective of transitioning to a circular economy by developing direct recycling routes for the studied batteries.



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Roll-to-roll (R2R) dry extrusion coating process for cathode-polymer electrolyte composites, consisting of nickel manganese cobalt oxide with high nickel content as the active material, carbon nanotubes or redox polymers as the conductive additive/binder, and polymer electrolyte, which can function also as a binder (binder solid-state polymer electrolyte).

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R2R pulsed laser deposition (PLD) process for an ultra-thin Li metal anode, combined with an inline process to deposit an inorganic solid electrolyte barrier layer on top of it.

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R2R slot-die coating process for a curable polycarbonate polymer electrolyte (separator solid-state polymer electrolyte), which is mechanically and electrochemically stable.

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Optimized interfaces for each material and layer, deposited by scalable methods, allowing improved performance and stability, and easy recycling.

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Digital quality control and inline characterisation tools for feedback control, combined with artificial intelligence and a digital twin for possible feedforward control, to go towards zero-defect and cost-efficient manufacturing.

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Technology assessment based on life-cycle thinking approach in respect to all three sustainability dimensions.

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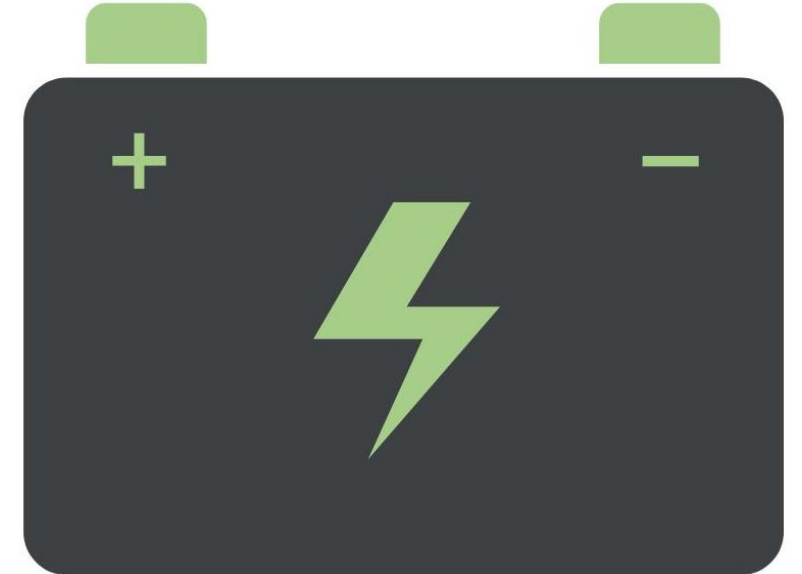
Tools/methods for stakeholder engagement respecting inclusive research

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# THE OBJECTIVES

# IMPACT

- The SOLiD technologies will provide production methods and materials throughout the whole battery manufacturing value chain.
- The SOLiD batteries will enable a longer driving range for electric vehicles due to their ultrahigh energy density.
- The protective layers on all interfaces enable high safety and increased charging rates.
- The cost-efficient processing methods (e.g. PLD) will help to gain reduced prices for the batteries while offering at the same time higher energy density, lifetime and safety.
- Being safe and long-lasting, the SOLiD batteries are well suitable e.g. as 2nd life batteries for stationary storage to enable integration of renewable energy production to households.
- The planned circular-by-design approach of SOLiD, i.e. the polymeric interlayers to allow easy delamination and direct recycling, will help to accelerate the circular economy of batteries.
- The ultrahigh energy density and durability of the fully optimized SOLiD battery will enable their utilization in several applications, opening up new application areas to allow reduction of greenhouse gas emissions.



# CONSORTIUM

The SOLiD project brings together a group of research and industrial partners throughout the battery manufacturing value chain starting from materials and ending to automotive industry, supported by professional dissemination and exploitation experts.

- **Finland:** VTT, PULSEDEON, AALTO
- **Belgium:** AVESTA BATTERY & ENERGY ENGINEERING
- **France:** CNRS, UNIVERSITE GRENOBLE ALPES, SPECIFIC POLYMERS, ARMOR BATTERY FILMS
- **Cyprus:** RTD TALOS LIMITED
- **Germany:** COATEMA COATING MACHINERY GMBH
- **Luxembourg:** OCSIAL EUROPE SARL
- **Czech Republic:** UNIVERZITA TOMASE BATI VE ZLINE
- **Italy:** CENTRO RICERCHE FIAT SCPA
- **Switzerland:** CSEM CENTRE SUISSE D'ELECTRONIQUE ET DE MICROTECHNIQUE SA - RECHERCHE ET DEVELOPPEMENT, BERNER FACHHOCHSCHULE





Thank you for your attention

More information:

[www.thesolidproject.eu](http://www.thesolidproject.eu)

<https://twitter.com/SOLiDProjectEU>

<https://www.linkedin.com/showcase/solidprojecteu>



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RTD Talos



**CENTRO  
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FIAT**



Berner  
Fachhochschule