Solid-statE lithium metal bAttery wiTh in situ hyBrid ELecTrolyte

Horizon Europe
THE NEXT EU RESEARCH & INNOVATION INVESTMENT PROGRAMME (2021 - 2027)
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HORIZON EUROPE PROGRAMME – HORIZON-CL5-2021-D2-01-03

Advanced high-performance Generation 4a, 4b (solid-state) Li-ion batteries supporting electro mobility and other.

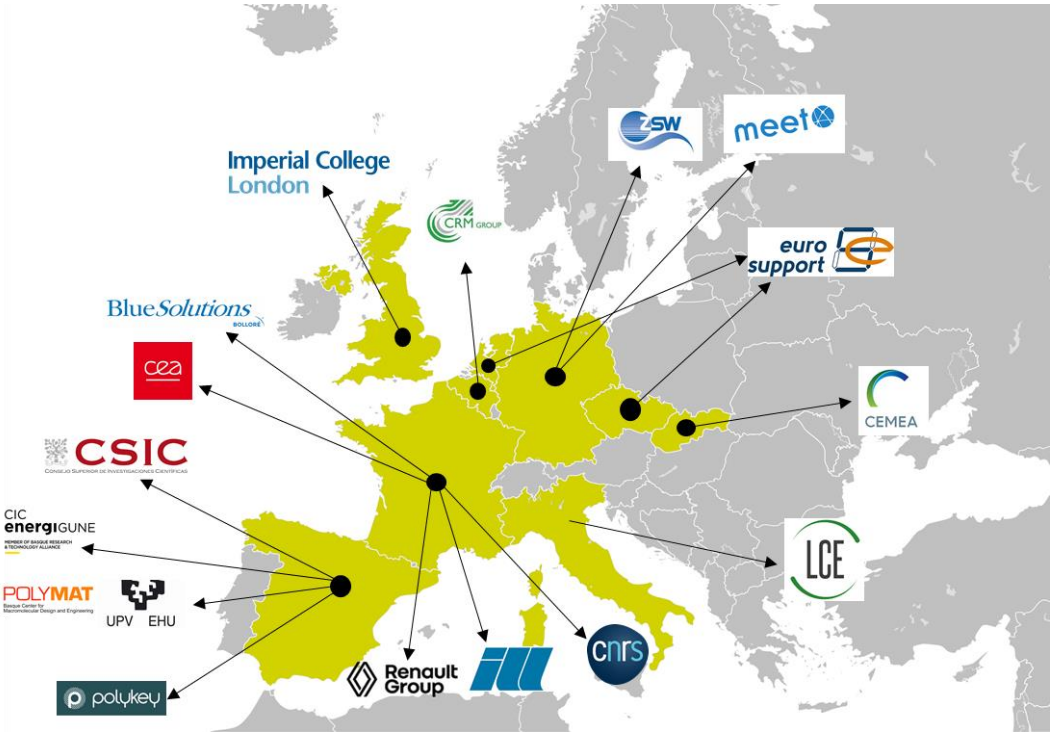
SEATBELT project – Grant Agreement no. 101069726

DELIVERABLE 4.1
Li Thickness optimization

Funded by
the European Union

SEATBELT consortium

No.	Participant	Acronym	Type	Country
1	Centre National de la Recherche Scientifique	**CNRS**	RTO	FR
2	Commissariat à l'Energie Atomique et aux Energies Alternatives	**CEA**	RTO	FR
3	Polykey Polymers	**PK**	SME	ES
4	Life Cycle Engineering	**LCE**	SME	IT
5	Centre De Recherches Metallurgiques	**CRM**	RTO	BE
6	Consejo Superior de Investigaciones Científicas	**CSIC**	RTO	ES
7	Blue Solutions	**BS**	IND	FR
8	Münster Electrochemical Energy Technology	**MEET**	UNI	DE
9	Universidad Del Pais Vasco	**UPV**	UNI	ES
10	Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg	**ZSW**	RTO	DE
11	CIC energiGUNE	**CICe**	RTO	ES
12	Institut Laue-Langevin Europe	**ILL**	RTO	EU
13	Renault	**Renault**	IND	FR
14	Euro Support Advanced Materials	**ES**	IND	NL
15	Imperial College of London	**ICL**	UNI	UK
16	Centrum Pre Vyuzitie Pokrocilych Materialov SAV	**CEMEA**	IND	SK



1. Overall project presentation

As of 2025, new generations of Li batteries based on silicon/carbon (Gen. 4a) and Li metal (Gen. 4b) anode, where flammable liquid electrolyte is replaced by a non-flammable solid-one, will take over the current Li-ion device. However, only all-solid-state Gen. 4b Li batteries are expected to fulfil the needed cell gravimetric energy density specifications demanded by electromobility and stationary applications. Therefore, SEATBELT ambition is to generate a local EU industry that revolves around a cost-effective, robust all-solid-state Li battery comprising sustainable materials by 2026. SEATBELT intends to achieve the first technological milestone of developing a battery cell (TRL5) meeting the needs of Electric Vehicle (EV) and stationary industry. The low-cost SEATBELT cell is safe-by-design with sustainable and recyclable materials, reaching high energy densities (>380 Wh/kg) and long cyclability (>500 cycles) by 2026 in line with the 2030 EU targets. The cells are produced by low-cost solvent-free extrusion process comprising a combination of innovative materials: thin Li metal, hybrid electrolyte, a safe cathode active material without critical materials and thin Al current collector. The cell design being optimized by interface (operando and atomistic modelling) and process (machine learning) methodologies. In addition, new in situ imaging instrumentation will be developed to investigate safety properties and mechanical deformation to assess cell safety in real conditions. An innovative recycling cycle from materials to cell level will be also established. Thus, SEATBELT will be the start point of a first EU all-solid-state battery value chain, whose main players in RTD and Industry sectors are within the consortium. So, cells and modules will cycle using industrially relevant protocols dedicated to EV and stationary applications. SEATBELT consortium is composed of 15 beneficiary partners and 7 affiliated entities, and 1 associated partner, from 8 European countries.

More information at:

Project website: https://seatbelt-project.eu/
CORDIS website: https://cordis.europa.eu/project/id/101069726

2. Public summary

The Work Package 4 “Anode & Interfaces” is related to the development of a thin Li metal anode coupled with a functional protective layer to minimize contact resistance and ensure homogeneous Li deposits. In addition, advanced physico-chemical and electrochemical analysis will be performed to correlate the Li microstructure and its texture to the overall anode performance (Li stripping/plating efficiency).

This deliverable describes the work performed to optimize the Li thickness for the SEATBELT cell development. Thin lithium metal electrodes are produced by extrusion or physical vapor deposition processes and their efficiency related to the Li Coulombic efficiency (dendrite-free, long cycle life) is investigated through the control of its microstructure and texture.

This deliverable presents 3 parts, the first one is dedicated to extrusion of Li metal foils, the second is focused on the development of deposited Li films, and the last one concerns the overall electrochemical performance of extruded and thin films of lithium.