SUBLIME

Solid state sUlfide Based LI-MEtal batteries for EV applications

Deliverable 8.4 Final dissemination report, summary of published documents

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Publishable summary

This is the final dissemination report of the Sublime. It reports on the dissemination activities underdone throughout the project lifetime. This includes online activities, non-scientific and scientific event participation, and scientific publications. For all activities, particularly for third-year activities, success criteria and indicators were set and evaluated. In summary, 20 out of 23 disseminations indicators have been reached their previously set objective at the end of the project lifetime. To illustrate the success in our dissemination activities we also describe some specific dissemination activities in more detail.

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Abbreviations

SYMBOL	SHORTNAME
GA	Grant Agreement
BEV	Battery Electric Vehicle
SEL	Solid Electrolyte Layer
LCA	Life Cycle Analysis
EMMC	European Material Modelling Council
RoMM	Review of Modelling of Materials
WP	Work package
WPLB	Work package leader board
SG	Stakeholder Group
DoA/DoW	Description of Action/Description of Work
PM	Person Month
CA	Consortium Agreement

1 Purpose of the document

1.1 Structure of document

This document describes the strategy that underpins the planned communication and dissemination actions of the SUBLIME-project, as well as the tools, measures and a specific approach that support a wide dissemination of the project's results.
Work Package 8 aims at carrying out effective communication and dissemination activities for SUBLIME, engaging both scientific and technical audiences, as well as stakeholders and citizens. A key objective is making achieved results increasingly understandable for stakeholders from governments, industry, academia, and suppliers in order to expedite their implementation. Another goal is to ensure that SUBLIME impacts will reach the highest number of potential users. AIT is in charge of developing dissemination tools as the leader of this Work Package.

A set of dissemination and external communication activities has been defined to reach the objectives of this WP. The attention of a wide group of potential users will be gained by a promotional campaign including measures such as project workshops, scientific publications, gathering information to be included with the project website and subsequently enabling a technology transfer accelerating the dissemination of ongoing research activities.
In Section 3 the SUBLIME project dissemination strategy is introduced, as well as the dissemination activities within SUBLIME, particularly addressing the following information:

- Key stakeholders and target groups
- Tools and channels used for dissemination
- Specific efforts made within defined dissemination channels

Section **Error! Reference source not found.** describes project-specific dissemination guidelines and organisational aspects along with dissemination procedures compliant with the SUBLIME Consortium Agreement, followed by aspects that are subject to dissemination activities that have been achieved recently and planned activities (Section **Error! Reference source not found.**).

1.2 Deviations from original Description in the Grant Agreement Annex 1 Part A

1.2.1 Description of work related to deliverable in GA Annex 1 – Part A

There are no deviations with respect to D.8.1 Dissemination and communication strategy and plan.

1.2.2 Time deviations from original planning in GA Annex 1 – Part A

There are no deviations with respect to timing of this deliverable

1.2.3 Content deviations from original plan in GA Annex 1 – Part A

There are no deviations from the Annex 1 – Part A with respect to the content.

2 About SUBLIME

SUBLIME will develop a complete value chain, from requirements to testing, for new sulphide-electrolyte-based solid-state battery cells with high capacity and high voltage stability (scalable to mass production) to reach gravimetric energy density of >450 Wh/kg and volumetric energy density of >1200 Wh/l. SUBLIME proposes the usage of high capacity and high voltage electrode materials. Li metal as anode (LiM), Ni rich NMC material e.g. or NMC90505 as cathode are foreseen to be used to achieve the targeted energy density. The battery will be inherently safe and will be able to operate at room temperature or lower; thus facilitating the start of the vehicle in a broad range of operating conditions. Interfaces showing a fast Li-ion transport will be developed in the project and partners will focus on developing close and (electro)-chemically stable interfaces with strong mechanical properties. The interfaces will be specifically designed to increase stability of the component and the malleable nature of the sulfide enables good interfacial contact.

On project conclusion, SUBLIME will bring the sulphide-electrolyte solid-state battery technology to TRL 6. The scale-up to pre-industrial volume will ensure that results are, indeed, scalable to large-volume commercial manufacturing. SUBLIME will deliver a roadmap to 2030, enabling eventual market entry by a very strong constellation of European partners.

3 Dissemination Approach

The SUBLIME Dissemination and communication strategy previously drafted approached communication activities regarding the project along with identifying respective key objectives, addressees, strategies and measures. It includes activities planned for the entire duration of the project. It was essential to plan and define activities regarding communication and dissemination activities prior to their implementation as they have a strong impact on the effectiveness of this project. There were regular evaluations and dissemination activities were a continuous topic in the SUBLIME Work Package Leaders Board.

Exploitation activities within the project are supported by the dissemination activities described in this document. Results were distributed to all relevant target groups, helping to generate future business opportunities for all project partners.

3.1 Aim

In order to optimise the impact of SUBLIME and to maximise the value of the entire project, the dissemination of results formed a crucial element. Besides an implementation during the project duration of 54 months, this step also addresses certain continuity exceeding the project duration itself. Further collaboration will (or may be) extend(ed) beyond the lifetime of the project.

3.2 Communication and Dissemination Objectives

Project tasks *T8.1 Scientific dissemination plan and activities* and *T8.2 Website, social media and communication towards stakeholders and citizens* was responsible for performing the dissemination and communication of project results to various stakeholders. It included the presentation of dissemination material at conferences and trade-fairs as well as the participation in European workshops and meetings of European associations.

The Dissemination strategy supported the objectives defined within the Exploitation Plan by enabling a broad communication and further dissemination measures such as a specific project branding.

3.3 Target Groups and Stakeholders

The first target group for the exploitable results was the SUBLIME stakeholder group (SG). It contains representatives of companies (as well as other OEMs), European or national associations in the field of transport (e.g. EMIRI) and research bodies willing to comment on and give input to the final roadmaps and any other results available.

SUBLIME has organised 2 SG workshops in order to inform on project developments, and to discuss with SG members on the boundaries and how to overcome them and define exploitation strategies.

3.3.1 Project website

www.SUBLIME-project.eu

Sublime's website www.sublime-project.eu is the main media hub for the project. Within the sections news, events and publications partners can publish articles about intermediate results, share upcoming events, review past events and post news about the project or whatever may be interesting for the specified target group. Updates were made constantly during the project period. In addition, all public deliverables are be uploaded on the website, and represent an opportunity for external dissemination. A publishable summary of all non-public deliverables can also be found on the website.

For monitoring and visitor tracking google analytics is used (after prior consent from the visitor, in line with GDPR regulations). Search Engine Optimization (SEO) is used to obtain a good ranking in search results.

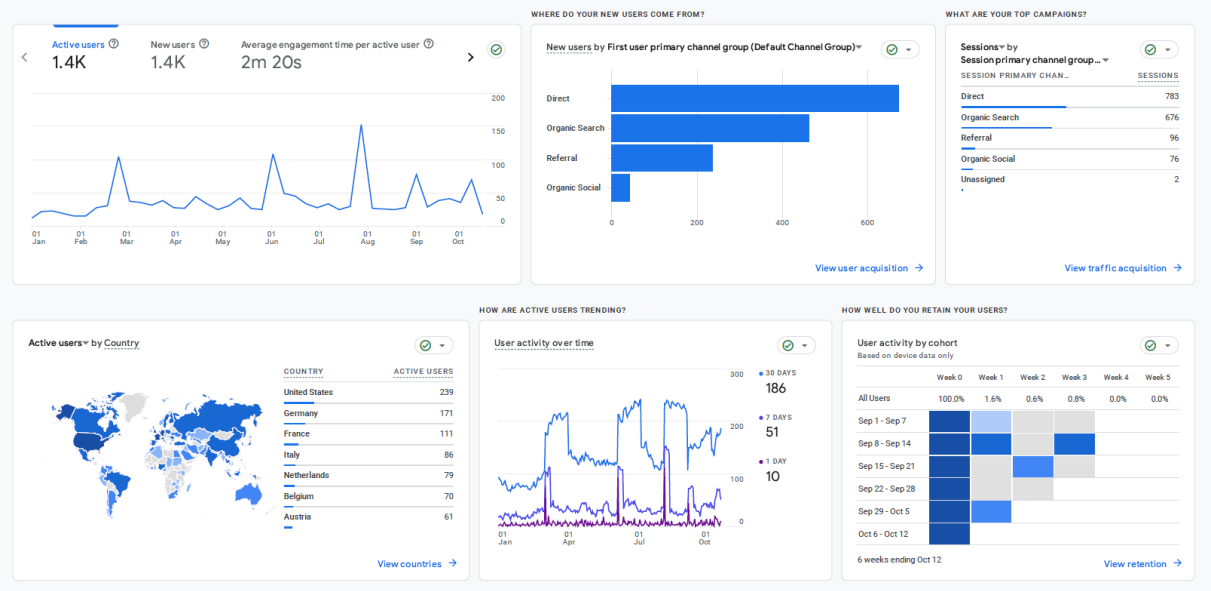

Figure 1, Google analytics data for the SUBLIME website in the timeframe between 1st of Jan. 2024 until 15th of Oct. 2024.

3.3.2 Partners' existing communication structures

The consortium helped owners of the results define messages that might be interesting and relevant for the specific target groups. Clear messages have been communicated via newsletters, press releases and other means.

3.3.3 Direct private conversations

Most partners are directly or indirectly members of the following associations: CLEPA (the automotive supply industry's association); CONCAWE (Research association of the European oil industry); EARPA (European Automotive Research Partners Association); EUCAR (Research council of the European automotive manufacturers). Many of them participate in the following technology platforms: EGVIA (European Green Vehicle Initiative Association); EPOSS (smart systems integration platform); ERTRAC (European Road Transport Research Advisory Council); ASAM (Association for Standardization of Automation and Measuring Systems); AUTOSAR (Automotive Open Systems Architecture partnership);

3.3.4 Scientific and other publications

In total 14 scientific publications have been written. An overview below:

- Molecular-Level Insight into the Interfacial Reactivity and Ionic Conductivity of a Li-Argyrodite Li6PS5Cl Solid Electrolyte at Bare and Coated Li-Metal Anodes, ACS Appl. Mater. Interfaces 13, 43734 (2021)
- Enhancing first-principles simulations of complex solid-state ion conductors using topological analysis of procrystal electron density, npj Comput Mater 8, 187 (2022)
- Current Status of Formulations and Scalable Processes for Producing Sulfidic Solid-State Batteries, Batteries & Supercaps 5, e202200328 (2022)
- Rational Optimization of Cathode Composites for Sulfide-Based All-Solid-State Batteries, Nanomaterials 13, 327 (2023)
- Film processing of Li6PS5Cl electrolyte using different binders and their combinations, Journal of Energy Storage 66, 107480 (2023)
- Unveiling Solid Electrolyte Interphase Formation at Molecular-Level: Computational Insights into Bare Li-Metal Anode and Li6PS5-xSexCl Argyrodite Solid Electrolyte, ACS Energy Letters 8, 4129 (2023)
- New Insights of Infiltration Process of Argyrodite Li6PS5Cl Solid Electrolyte into Conventional Electrodes for Solid-state Batteries, Batteries 9, 503 (2023)
- Critical Current Density Measurements of Argyrodite Li6PS5Cl Solid Electrolyte under Ambient Conditions, Journal of the Electrochem. Soc. 170, 100525 (2023)
- Understanding Interfaces at the Positive and Negative Electrode on Sulfide-Based Solid-State Batteries, ACS Applied Energy Materials 6, 11030 (2023)
- Scalable Production of Separator and Cathode Suspensions via Extrusion for Sulfidic Solid-State Batteries, 2023, ChemElectroChem e202300452
- Static and Dynamic Models of Electrode Coatings for Solid-State Lithium Anode Batteries with Superionic Electrolytes: Development of a Tailored Reactive Force Field for Multiscale Simulations – J. Phys. Chem. C 2023

- Investigating sulfide based all solid-state cells performance through P2D modeling – Chem. Eng. J. Adv 2024
- Unveiling the Reactivity and the Li-Ion Exchange at the PEO-Li6PS5Cl Interphase: Insights from Solid-State NMR – Small Struct. 2024, 2400139,
- Cost-Effective Solutions for Lithium-Ion Battery Manufacturing: Comparative Analysis of Olefine and Rubber-Based Alternative Binders for High-Energy Ni-Rich NCM Cathodes – ChemElectroChem, 2024, e202400465

SUBLIME was covered in 5 international magazines:

- www.electrive.com - SUBLIME sulphide solid-state electrolyte batteries (25.07.2023, Carrie Hampel)
- www.emove360.com - AIT Austrian Institute of Technology: SUBLIME – Solid-state sulfide-based Li-metal batteries for electric vehicles (25.07.2023)
- de.topcarnews.net - SUBLIME: Forschungsprojekt zu Feststoff-Batterien mit Sulfid-Elektrolyt
- www.automobil-cluster.at - SUBLIME: Festkörper-Li-Metall-Batterien auf Sulfidbasis für Elektrofahrzeuge (04.08.2023)
- www.futurezone.at - Neuer Festkörperakku könnte Ende der Reichweiten-Angst bedeuten (11.08.2023, David Kotrba)

3.3.5 Events, including trade shows and exhibitions

The Sublime project has been represented in 23 conferences. An overview below:

- Power Our Future 2022
- Ceramics in Europe 2022
- Giornate dell'Elettrochimica Italiana 2022
- International Vienna Motor Symposium 2022
- HyVolution 2022
- Car Symposium Bochum
- Battery Experts Forum 2022
- IBPC 2022
- Battery Modeling and Advanced Numerical Simulations 2022
- Aachen Colloquium on Sustainable Mobility 2022
- RTR Conference 2023
- Holst Center Innovation Day
- ECerS 2023
- ECSSC 2023
- ECS fall meeting 2023
- German State of North-Rhine-Westphalia (NRW) Zenith meeting 2024

- TRA2024
- 37th ISE Topical Meeting 2024
- International Symposium on Automotive and Engine Technology 2024
- The 6th Automotive Battery Conference 2024
- International Symposium on Beyond Li-Ion Batteries 2024 - BeLI24
- Conference on Battery Direct Recycling 2024
- Enlit 2024

3.3.6 Social Media

The news on Sublime results and events was shared by the partner AIT via LinkedIn, Facebook, Twitter and of course the website.

3.3.6.1 LinkedIn / Facebook / Twitter

In total 13 events were disseminated via the social media channels.

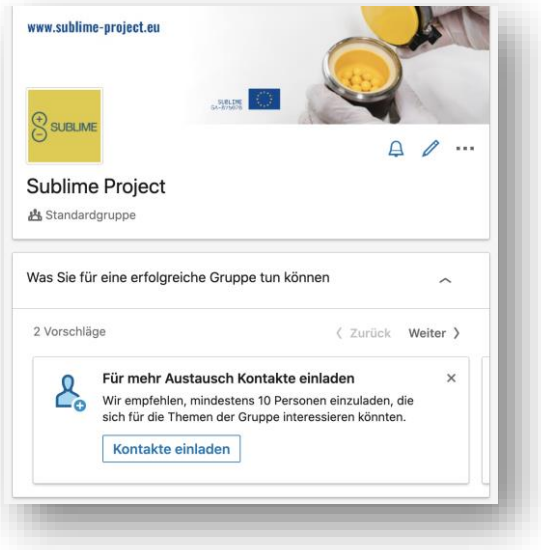

Figure 3-2: SUBLIME LinkedIn group

3.3.6.2 Twitter

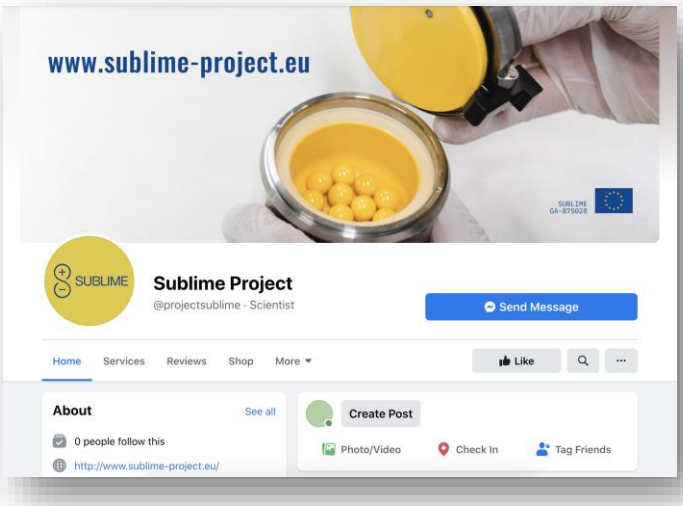

Figure 3-4: SUBLIME Twitter account

Figure 3-3: SUBLIME Facebook page

3.3.7 Newsletter

SUBLIME has used Mailchimp as newsletter tool. In total 4 newsletters have been presented and a total of 22 subscribers were reached. The newsletters can also be found on the website.

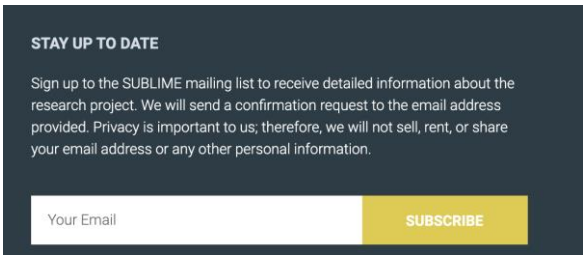

Figure 3-5: SUBLIME Newsletter Subscription tool

3.4 Quantification and Timing of the Dissemination activities

The following table provides a quantification of the project's dissemination activities and sets a basis for verifying whether the project dissemination objectives have been met. Monitoring will be done throughout the project and included in the official reporting at M18, M36 and M48.

Table 3-1 Quantification of general SUBLIME Dissemination Activities

Dissemination measure	Purpose	Key performance indicators	Targeted Audience	Outcome
Project updates on SUBLIME website	General information	≥ 8 updates/year ≥ 1000 views/year	General public	Reached
Organization of GA AND WPLB meetings	Knowledge exchange	≥ 2 meetings/year/1 month	Consortium members	Reached
Organization of workshops	Knowledge exchange	≥ 1 workshops/year	EV Community	Reached
Participation in Conferences, meetings	Knowledge exchange	>20 conferences	EV Community, standardisation Committee	Reached
Open Access publications	Research	> 5-10 publications*	Scientific Community	Reached
Online publishing (online magazines, newspapers, newsletters, blogs)	General information	≥ 7 newsletters (half-yearly)	General Public	Not reached but information shared via social media

3.4.1 Collaboration with S-BAT cluster projects for impact maximization

S-BAT (Solid-state batteries) cluster aims at **virtually clustering** 3 independent R&D projects on solid-state battery developments, submitted under the LC-BAT-1-2019 topic as presented in Table 3-2. Thanks to synergies across projects, they can jointly achieve a higher level of impact beyond project level, contributing more strongly to the further development and adoption of solid-state batteries in the electric mobility sector. This will bring about the transition towards the next generation of electro mobility in Europe by 2030, in alignment with the targets and timeline defined in the **ERTRAC electrification roadmap[1] and the SET Plan[2].** As per the ERTRAC 2017 Electrification Roadmap, increase in affordability and driving range improvement are two enablers for increasing EV market penetration, both areas where S-BAT cluster will make a substantial contribution.

[1] http://egvi.eu/uploads/Modules/Publications/ertrac_electrificationroadmap2017.pdf

[2] https://setis.ec.europa.eu/sites/default/files/set_plan_batteries_implementation_plan.pdf

Table 3-2 The concept of the three projects of the S-BAT virtual cluster

Project	Coord	Concept
SUBLIME	FEV (DE)	Sulfuric solid electrolyte with high nickel rich cathode and LiM as an anode
SAFELiMOVE	CIC (ES)	Hybrid solid electrolyte combined with high voltage cathode materials and LiM as an anode
ASSAP	POL (IT)	Organic & polymer/ceramic composites electrolytes with carbon-sulphur cathode and LiM as an anode

The cluster envisions following interaction topics between the three projects.

- Promote awareness of world-wide IP and expertise in the field of solid-state batteries, to enlarge the EU knowhow in the field and in particular Li-Metal.
- Interaction between modelling experts to enlarge the EU competences
- Define the future EU technological roadmap for solid-state battery development

Such interaction will be managed through the task 8.1.1, led by AIT and ABEE. During the project phase additional core experts will be defined by each project for dedicated sectors. This will be done on regular basis to avoid any overlap and to maximize the impact. These above listed topics are preliminary and will be further elaborated once the cluster internal meetings have been established. Furthermore, the cluster will open its doors to other projects that are funded under the LC-BAT-1 framework. Such cluster will deliver a coordinated action plan and reporting for the dissemination of SUBLIME, and roadmap towards 2030 as a common vision further.

Table 3-3 Planned interaction between the S-BAT cluster projects.

Name	Timing	Motivation for S-BAT dissemination
Coordinators to meet on the sidelines of the coordinator's day	Before kickoff	Coordinate plans Organize a telecall between core teams
Face-to-face meeting on the sidelines of a GA	First year	Coordinate R&D progress align with PO Network between S-BAT partners
Face-to-face meeting on the sidelines of a GA	Third year	Show intermediate results, awareness towards EC Network between S-BAT partners
Telecalls between core group	Regular	Coordinate R&D progress
Sidelines of other external events: EGVIA, TRA, etc.	Regular	Showcase specific S-BAT outcomes Dissemination and awareness
Other dissemination actions	Regular	Share newsletters, news, events, and flyers across the projects.

3.5 Dissemination Acknowledgement and Disclaimer

Dissemination activities and publications for sublime, including the project website, have met the following criteria:

- Display the Emblem of the European Union in accordance with the official guidelines provided by the European Commission. When presented in association with a logo, the Emblem of the European Union will be displayed adequately prominent.

- All publications have included the following statement as defined in the Grant Agreement (Art. 29.4):

  "This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 875028."

3.5.1 Project Logo and Brand Identity

At the beginning of the project a branding for Sublime was established. A plus and minus symbol to indicate batteries in combination with an S for Sublime. The S is in the form of an infinity loop and can therefore also stand for the energy cycle, or for mobility (two circles). Plus and minus can also be interpreted as reducing and increasing, for example reducing costs of EVs and increasing their capabilities. In combination we get an infinite, dynamic icon which represents electricity and mobility.

Figure 3-6: SUBLIME Logo

The brand colors are a combination of the EU blue and a EU yellow, which could also be interpreted as the color of sulfur, which is also part of the project name.

The typefaces are based on free open source fonts from google and offer a clearly legible and professional look, suitable for presentations and reports.

3.5.2 Flyer and Newsletter

A project flyer (leaflet) has been created in order to promote the project to a broader audience and to specific target groups. The finished flyer will be distributed to the target audience as printed version and will be available as digital version on the website. Updates were made regularly and customized flyers for conferences were made.

Figure 3-7; SUBLIME folder used e.g. for the Enlit 2024 conference.

4 Discussion and Conclusions

The initiation of this dissemination plan has taken place in the proposal phase and was updated during the grant preparation and in project month 6. Dissemination was a continuous process, dissemination activities were tracked by AIT, as Dissemination Manager.

5 Acknowledgement

The author(s) would like to thank the partners in the project for their valuable comments on previous drafts and for performing the review.

Project partners

#	PARTICIPANT SHORT NAME	PARTNER ORGANISATION NAME	COUNTRY
1	FEV	FEV Europe GmbH	Germany
2	ABEE	ABEE Group	Belgium
3	CICE	CIC energiGUNE	Spain
4	FORD	FORD Otomotiv Sanayi A.S	Turkey
5	CRF	Centro Ricerche FIAT S.C.p.A.	Italy
6	AIT	Austrian Institute of Technology GmbH	Austria
7	MIM	MIMITech GmbH	Germany
8	POL	Politecnico di Torino	Italy
9	SAFT	SAFT Batteries	France
10	SOL	SOLVAY – Rhodia Operations	France
11	TNO	TNO Holst centre	Netherlands
12	IST	Fraunhofer IST	Germany
13	CEA	Commissariat à L'Energie Atomique et aux Energies Alternatives	France
14	UMC	UMICORE	Spain
15	UNR	Uniresearch BV	Netherlands

Table 5-1: Project Partners

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement no. 875028.

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