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Sodium-Ion and sodium Metal BAtteries for efficient and sustainable next-generation energy storage

GRANT AGREEMENT No. 963542

SIMBA – Deliverable Report

<< D2.5 – Identification of the most suitable SIPEs for WP3 and WP4 >>

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Related WP	WP2	
Deliverable Title	Identification of the most suitable SIPEs for WP3 and WP4	
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Reviewed by (if applicable)	Elkem	2022-10-14
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Publishable summary

The main objective of the task is to develop stable, single-ion conducting polymer electrolytes (SIPEs) with enhanced electrochemical stability (up to 4.4 V (vs. Na^+/Na)) and good ionic conductivity at room temperature, for sodium-ion and sodium metal batteries. The first step is synthesizing the sodium salt monomer (SSM), which will be the ionically active segment. Such SSM should provide good ionic conductivity at room temperature.

Thus, HIU-KIT screened different SSM's anionic centres, such as carboxylate ($-CO_2-$), sulfonate ($-SO_3-$), and sulfonylimide ($-SO_2N^-SO_2-$), identifying the best candidate. Second, the SSM was mixed with neutral polymer to manufacture mechanically stable polymer membranes. Third, the ionic conductivity has been improved (the solid-state electrolytes (SSEs) exhibit low ionic conductivity at room temperature) by adding molecular transporters to the polymer membrane creating solid SIPEs. The basic electrochemical properties (conductivity and electrochemical stability window) of developed SIPEs were evaluated.

The best candidates regarding conductivity values and electrochemical stability were further optimized in terms of membrane manufacturing to enhance ionic conductivity and mechanical properties. The potential candidates for SIPEs for sodium-ion and sodium-metal batteries are further characterized (thermally, electrochemically, and interfacial properties). Finally, the best candidate is up-scaled for further work in WP3 (interfacial characterization and compatibility studies with the positive and negative electrode) and WP4 (development of an all-solid-state sodium-ion demonstrator).

8 Appendix B- Acknowledgement

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Project partners:

#	Partner	Partner Full Name
1	TUDa	TECHNISCHE UNIVERSITAT DARMSTADT
2	UU	UPPSALA UNIVERSITET
3	UBham	THE UNIVERSITY OF BIRMINGHAM
4	WMG	THE UNIVERSITY OF WARWICK
5	KIT	KARLSRUHER INSTITUT FUER TECHNOLOGIE
6	CEA	COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES
7	IFE	INSTITUTT FOR ENERGITEKNIKK
8	SAS	USTAV ANORGANICKEJ CHEMIE SLOVENSKA AKADEMIA VIED (Institute of Inorganic Chemistry, Slovak Academy of Sciences)
9	FHG	FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.
10	JM	JOHNSON MATTHEY PLC
11	Elkem	ELKEM AS
12	YUN	YUNASKO-UKRAINE LLC
13	SAFT	SAFT
14	Altris	ALTRIS AB
15	Recupyl	TES RECUPYL SAS
	UNR	UNIRESEARCH BV

Appendix D – Disclaimer/Acknowledgement

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