EUROPEAN COMMISSION

HORIZON 2020 PROGRAMME - TOPIC H2020-LC-BAT-2020
Sodium-Ion and sodium Metal BAtteries for efficient and sustainable next-generation energy storage

GRANT AGREEMENT No. 963542

SIMBA – Deliverable Report

<< D2.1 – Optimized ceramic anode support identified and tested at coin cell level >>

Deliverable No.	SIMBA D2.1	
Related WP	WP2	
Deliverable Title	Optimized ceramic anode support identified and tested at coin cell level	
Deliverable Date	2022-08-31	
Deliverable Type	REPORT	
Dissemination level	Confidential – member only (CO)	
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Status	Final	2022-08-29

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 963542.

Publishable summary

The deliverable D2.1 presents a detailed description of the strategy chosen to identify the most promising ceramic support allowing for efficient and reversible sodium plating. Moreover, various silicon-based ceramic materials actively intercalating sodium are also processed and examined. Ceramic materials are obtained via pyrolysis of a pre-ceramic polymer. The chemical composition and the morphology of the final ceramic can be tuned by choosing an appropriate polymer as well as by tunning the conditions of the pyrolysis (temperature, time, atmosphere). All the produced materials have been structurally and microstructurally characterized using SEM, BET, Raman and XRD.

The ceramics have been tested in a half cell configuration using Swagelok-type cells in order to determine the electrochemical properties. Cyclic voltammetry and galvanostatic cycling with potential limitation have been carried out. For the SiCN-1000 the insertion capacity reached an average value of 100 mAh/g. Besides the insertion capacity the ceramic showed the possibility of stable and reversible plating of the Na on the matrix by limiting the plated amount until 160 mAh/g. The SiOC materials have been first characterized in lithium half-cell configuration. Thus, the SiCN-1000 has been identified as the best performing material, both in intercalation and plating modus.