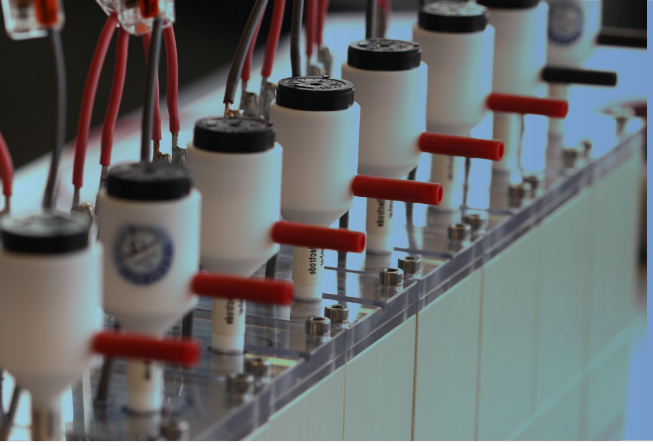


Investigations on the Effect of Carbon Surface Functional Groups

Technical Program Series

Technical Summary

Duration: April 2021 - June 2023

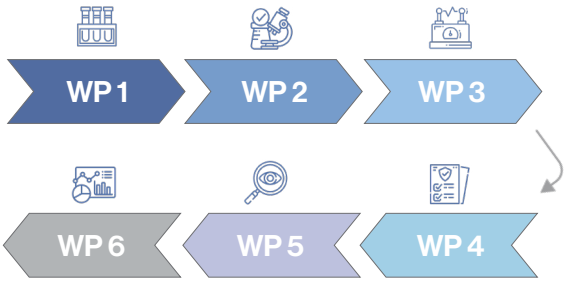
Partners: Fraunhofer ISC, Wrocław University of Science and Technology

Focus: Automotive applications

Objective: To understand the impact of carbon additive surface functional groups on the electrochemical performance of negative electrodes in advanced lead batteries.

Location: Germany and Poland

Work Packages



WP 1	Optimization of preparation conditions and functionalization of carbon additives
WP 2	Characterization of carbon additives
WP 3	Preparation of negative electrodes and 2V laboratory cells
WP 4	Electrochemical performance of test cells
WP 5	Structural investigations of negative electrodes
WP 6	Status updates and reporting

About the Project

Addressing the performance improvements for automotive lead batteries, this project focused on determining the influence of surface functional groups of carbon additives on the electrochemical performance of a negative electrode for lead batteries and comparing it to structural effects.

The study involved developing and thoroughly characterizing and testing a series of well-defined carbon additives with specific surface functional groups and controlled structural properties. These additives were used in the negative electrodes of 2V laboratory test cells to assess their impact.

Results and Applications

Comprehensive Analysis | Performance Evaluation | Practical Implications

Comprehensive Analysis:
Two different pristine carbons with low and high specific external surface area were modified to obtain acidic and basic carbons with low and high external surface area. A series of carbon additives were synthesized and tested.

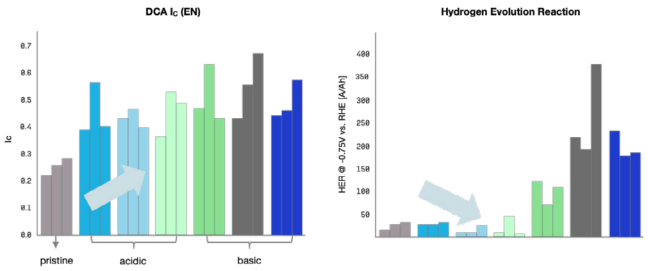


Figure 1: Acidic carbons can increase DCA and reduce HER activity.

Performance Evaluation:
The project team demonstrated that the external surface area affects dynamic charge acceptance (DCA) and that certain surface functional groups positively affect cold-cranking ability (CCA) and suppress hydrogen evolution reaction (HER) activity.

Practical Implications:
This research provided valuable insights into how carbon surface functional groups enhance automotive battery performance, showing specific groups can increase DCA while lowering HER activity and improving CCA.

Find out more
More information about the technical project and other technical projects of CBI available on our WEBSITE.

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