

SE²A International Female Programme - International Master's project/thesis:

Integration of Aramid Additives into Sulfur-Carbon Composite Cathodes for Solid-State Lithium-Sulfur Batteries with Enhanced Stability for Aviation

Project Description

The solid-state lithium-sulfur battery (SSLSB) is considered one of the promising battery types to meet the requirements of short-range electric aircraft due to its high energy density. However, it shows rapid degradation during operation over repeated cycles, mainly attributed to the polysulfide shuttle effect. Recently, it has been demonstrated that aramid additives can effectively inhibit the polysulfide shuttle and contribute to address this problem. Therefore, this project will investigate the improvement of cycling stability by incorporating aramid additives into the polymer-based binder of sulfur-carbon composite cathodes, based on a high-performance cross-linked polymer electrolyte developed in our group within the first phase of the Cluster of Excellence SE²A.

Once the composite S-C cathodes are produced, their structural properties will be evaluated and the components will be assembled into Li-S battery coin cells, and their electrochemical performance will be evaluated and correlated with material properties. Upon completion of this project, we expect to gain valuable insights into the degradation mechanisms of solid-state lithium-sulfur batteries and identify innovative materials to enhance their performance.

This project is set within a highly interdisciplinary environment at the Battery LabFactory Braunschweig, a research center of TU Braunschweig. It will involve the following tasks:

- *Synthesis of novel sulfur-carbon composite cathodes with aramid additives integrated into cross-linked PETEA-PEG polymer binders*
- *Fabrication of lithium-sulfur battery coin cells based on sulfur-carbon composite cathodes and PETEA-PEG hybrid solid electrolytes*
- *Characterization of the materials and the battery performance*

Requirements

- *We seek a highly motivated master student candidate with a degree at Bachelor's level (or equivalent) in Mechanical Engineering, Material science, Chemistry, Chemical Engineering or another relevant discipline*
- *Experience in electrochemistry and material characterization is highly advantageous*
- *You must show a strong interest in battery research and materials processing and should possess extensive laboratory experience in materials synthesis and battery assembly*
- *We expect excellent English language skills as well as basic German knowledge or willingness to acquire basic language skills*
- *You should be a good team-worker and possess great observational and communication skills*

Contact information

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<https://www.tu-braunschweig.de/se2a/open-positions/se2a-international-female-programme-international-masters-projects>

The SE²A programme offers funding for a monthly grant of up to 934 Euro (current max. BAföG rate) up to a maximum duration of 6 months for excellent female students from abroad.

Candidates with handicaps will be preferred if equally qualified. Please enclose a proof. The position is part of the SE²A International Female Programme, so only applications by female students of non-German universities are possible. Applications from people of all nationalities are welcome. Please note that application costs cannot be refunded.

The personal data will be stored for the purpose of processing the application. By submitting your application, you agree that your data may be stored and processed electronically for application purposes in compliance with the provisions of data protection law. Further information on data protection can be found in our data protection regulations at <https://www.tu-braunschweig.de/datenschutzerklaerung-bewerbungen>.