



Technische
Universität
Braunschweig



PhD-Researcher Position (m/f/d) within the SE²A Research Cluster

Operando *characterization and optimization of all-solid-state lithium-sulfur battery components, cells and systems*

Temporary Position (up to 3 years), up to Salary Level EG 13 TV-L, 100%

Background:

The Cluster of Excellence SE²A - *Sustainable and Energy-Efficient Aviation* is a DFG-funded interdisciplinary research center investigating technologies for a sustainable and eco-friendly air transport system. Scientists from aerospace, electrical, energy and chemical engineering as well as economics and social science are working on the reduction of drag, emissions and noise, life-cycle concepts for airframes, improvements in air traffic management and new technologies for energy storage and conversion. Technische Universität Braunschweig, the German Aerospace Center (DLR), Leibniz University Hannover (LUH), the Braunschweig University of Art (HBK) and the National Metrology Institute of Germany (PTB) have joined forces in this extraordinary scientific undertaking. The overall project is structured into the three core research areas "Assessment of the Air Transport System", "Flight Physics and Vehicle Systems" and "Energy Storage & Conversion". (www.tu-braunschweig.de/en/se2a)

Employment:

The position is located at the *Institute of Energy and Process Systems Engineering* (<https://www.tu-braunschweig.de/en/ines/>) in *Braunschweig*. The entry date is 01/01/2023, and the duration is initially limited until 31/12/2025. The position is part-time suitable, but should be occupied 100%. For all doctoral researchers of the cluster, an active participation in SE²A's own qualification program is mandatory, the time effort for this training measure entails 10% of the working time. The payment is made according to task assignment and fulfillment of personal requirements up to salary group EG 13 TV-L. International applicants may have to successfully complete a visa process before hiring can take place. Applications from international scientist are welcome. The Cluster SE²A aims to increase the share of women in academic positions. Applications from female candidates are very welcome. Where candidates have equal qualifications, preference will be given to female applicants. Candidates with handicaps will be preferred if equally qualified. Please enclose a proof.

Task:

All-electric short-range aircraft require batteries with substantially higher performance characteristics compared to automotive batteries, combining high specific energy and power with high stability. A promising battery type to fulfill these requirements is the all-solid-state lithium-sulfur battery containing a solid electrolyte. While high capacity has been realized, it suffers fast degradation during operation over multiple charge-discharge cycles, which is caused by several mechanisms such as the polysulfide shuttle effect. Therefore, novel materials need to be designed, synthesized and characterized. Additionally, the developed materials are incorporated and processed into components and assembled into battery cells,

and the electrochemical performance will be determined and correlated to material properties. Overall, this project will contribute significantly to our understanding of the causes of degradation in all-solid-state lithium-sulfur batteries and enable us to optimize processing conditions to achieve the best electrochemical 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:

- *Development of advanced non-invasive characterization methods for performance and degradation analysis*
- *Comprehensive characterization of components and assemblies of different battery cell formats (operando and post-mortem)*
- *Optimization of system performance based on realistic aviation power profiles, and thus combining interdisciplinary viewpoints from engineering and (electro)chemistry*

Who we are looking for:

- *A highly motivated PhD candidate possessing a degree at Master's level in Chemical Engineering*
- *Experience in electrochemistry, material characterization and fabrication of solid state batteries is essential*
- *Experience with lithium-sulfur batteries would be highly advantageous*
- *Strong interest in battery design and analytic*
- *Excellent English language skills, basic German knowledge or willingness to acquire basic language skills*
- *Good team-working, observational and communication skills are essential*

Application Process:

Applications should be sent by e-mail or mail to Prof. Dr.-Ing. Daniel Schröder, TU Braunschweig, Institute of Energy and Process Systems Engineering, Langer Kamp 19b, 38106 Braunschweig (*bewerbungen-ines@tu-braunschweig.de*) and must contain the following documents until 31.11.2022.

- Cover Letter stating your motivation to apply for this position
- Curriculum Vitae including complete address, phone number, email address, educational background, language skills, and work experience
- Copies of bachelor and master diploma and transcript of grades in original language and in English or German translation
- Additional Documents must be provided on request

All documents should be in PDF format, preferably in a single file. Personal data and documents relating to the application process will be stored electronically.

Please note that application costs cannot be refunded. For the purpose of carrying out the application process, personal data will be stored.

For more information, please call Prof Schröder on +49 (0) 531 391-3030.

