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

Synthesis and evaluation of hybrid solid electrolytes for all-solid-state lithium-sulfur batteries

Temporary Position (up to 3 years), up to Salary Level EG 13 TV-L, 67%

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 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 for Particle Technology (https://www.tu-braunschweig.de/en/ipat)* in *Braunschweig*. The starting date is as soon as possible, and the duration is initially limited until *31/12/2025*. The position is suitable for part-time employment, but should be occupied as 67% PhD position. 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 scientists 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 (please enclose proof) will be preferred if equally qualified.

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, in particular hybrid electrolytes combining two functional materials, to inhibit the migration of polysulfides. Additionally, the developed materials are incorporated and processed into the composite cathode and separator. The components will be 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:

- *Investigation of novel hybrid electrolytes with low weight based on organic and inorganic components*
- *Fabrication of lithium-sulfur cells based on the synthesized hybrid electrolytes and carbon-sulfur composites*
- *Characterization of the obtained composites, electrodes and cells with respect to structural properties (using e.g. electron microscopy, XRD, XPS) as well as electrochemical properties*

Who we are looking for:

- *A highly motivated PhD candidate possessing a degree at Master's level (or equivalent) in Material science, Chemistry, and Chemical Engineering or another relevant discipline*
- *Experience in electrochemistry and material characterization would be highly advantageous*
- *Strong interest in battery design and materials processing*
- *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 to Prof. Dr. Georg Garnweitner, TU Braunschweig, Institute for Particle Technology, Volkmaroder Str. 5, 38104 Braunschweig (*g.garnweitner@tu-braunschweig.de*) and must contain the following documents until 28. 11. 2022.

- Cover Letter stating your motivation to apply for this position
- Curriculum Vitae including complete address, phone number, e-mail 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 contact Prof. Garnweitner via e-mail or telephone on +49 (0) 531 391-65371.