

PhD Position:

High Voltage Cathode Active Material and Low Pressure Ionically Conductive Binder to Push the Limits of All-Solid-State Batteries

All-solid-state batteries (ASSBs) are considered to be the next step in increasing both the energy density and the intrinsic safety of Li-ion batteries compared to batteries with conventional liquid electrolytes. The pressure sensitivity during pressing and cell operation plays a key role in the market penetration of sulfidic solid-state batteries. While current research often strives for material development, the industrialization of ASSBs requires a change in focus of the entire cell, especially with realistic fabrication and operating pressures. A less investigated research question is whether and how the integration of ion-conducting polymers can contribute to the minimization of operating pressures and the optimization of interfaces, especially in connection with the irreversible volume change of high-energy cathode materials.

The research project "High Voltage Cathode Active Material and Low Pressure Ionically Conductive Binder to Push the Limits of All-Solid-State Batteries" is part of the interdisciplinary research consortium of TUMint.Energy Research GmbH. In close cooperation with members of the Gasteiger research group and the Rieger and Nilges chairs, high-energy cathode materials and their compatibility with ion-conducting polymers in industry-relevant cell designs will be investigated.

Therefore TUMint.Energy Research GmbH in cooperation with the Chair of Technical Electrochemistry (TEC), under the direction of Professor Hubert Gasteiger, is looking for a PhD student to support this project.

Who we are:

- We are a non-university and interdisciplinary research hub specializing in energy storage technologies with the support of TUM.
- Focusing on solid-state batteries our mission is to bring together experts from fundamental material research, electrochemical characterization up to production technologies.

Your tasks:

- Optimization of cathode coatings with regard to rheology, morphology, porosity and homogeneity of the solid electrolyte and cathode active material. Experiments on the incorporation of ion-conducting polymers in separator and cathode sheets.
- Construction of ASSBs in various cell formats (coin cell format, pouch cell format, cells with micro-reference).
- Characterization of the influence of different polymer amounts in relation to the cycling number and optimal fabrication and operating pressures.
- Ex-situ XPS studies on the stability of ionic conductor and polymer.
- Presentation and publication of own results at internal cluster meetings with industrial partners, international conferences and in scientific journals.

Your profile:

- **Educational qualification:** Above-average Master's degree in chemical engineering, process engineering, chemistry, physics or related courses.
- **Prior knowledge:** Experience in the field of electrochemistry esp. batteries and battery materials or comparable.
- **Personality and working style:** Curiosity, passion and accuracy to get to the bottom of scientific challenges; ability to work in an international team; high level of independence and self-motivation.
- **Language skills:** Fluent in English

We offer:

- The position is to be filled from January 2024 and is initially limited to 2 years.
- Payment according to TV-L E13 (75%).
- Opportunity to present own research results at national/international conferences and project meetings.
- Close cooperation with partners from industry and other TUM research groups (Chemistry, Mechanical Engineering, Electrical Engineering) as part of the overall TUMint.Energy Research GmbH consortium.

The best results are achieved in a diverse and inclusive team. Therefore, all qualified applications for the position will be considered, regardless of gender, age, disability, religious affiliation, ethnic origin or sexual identity.

TUMint.Energy Research GmbH strives to increase the proportion of women and therefore expressly welcomes applications from women. The position is suitable for severely disabled persons. Severely disabled applicants will be given preference if their suitability, qualifications and professional performance are otherwise essentially the same.

Please send your application (cover letter, certificates with transcripts from both Bachelor's and Master's degrees, CV) to application.tec@nat.tum.de and specify the project for which you are applying in the subject line. **Applications will be accepted until 31.01.2024.** If you have any questions about the project or application process, please contact Tobias Kutsch (kutsch@tumint-energy.de).

You submit personal data as part of your application. Please note our **[data protection information in accordance with Art. 13 of "Datenschutz-Grundverordnung \(DSGVO\)" on the collection and processing of personal data in the context of your application.](#)** By submitting your application, you confirm that you have taken note of TUM's data protection information.

[Jonas Lindner](#)
Geschäftsführer
TUMint-Energy Research GmbH
Lichtenbergstraße 4, 85748 Garching
lindner@tumint-energy.de

[Tobias Kutsch](#)
Technical University Munich
Chair for Technical Electrochemistry
(Prof. Gasteiger)
Lichtenbergstraße 4, 85748 Garching
kutsch@tumint-energy.de