PhD position in all-solid-state lithium-ion batteries: Electro-chemo-mechanical continuum-based FEM model development

The multidisciplinary Electrochemical and Surface Engineering (SURF) research group of the Vrije Universiteit Brussel (VUB) looking for a highly motivated researcher to carry a PhD thesis on hybrid multiscale modeling/experimental methodology development for performance and lifetime prediction of composite cathodes for all-solid-state batteries. The research is situated within the framework of the Agency for Innovation and Entrepreneurship (VLAIO) LifeSBat. The project involves several academic and industrial partners. Your task within the project will be to develop a 2D/3D physics-based finite element models to assess the performance and lifetime of all-solid-state batteries composite cathodes. For accurate predictions, the model shall include the mechanical, and ageing phenomena. For this purpose, you will use experimental data (from literature and data sourced within the project), atomistic and mesoscale modelling input (DFT, AIMD, MD and CGMD) from the other partners within the project to develop and improve physics-based finite element models.

Description

You will work in a multidisciplinary and multicultural research group, with people from all over the world, uniting all languages and cultures in one large community, oriented to study electrochemical processes by combining both modelling and experimental approaches. The aim of the project is to develop a material agnostic modelling tool for the prediction of performance and lifetime (ageing) of composite cathode/solid electrolyte materials for all-solid-state Li-ion batteries to accelerate developments in a cost-effective way. A hybrid multiscale modelling/experimental methodology is applied because the performance of the composite cathode is the result of an intense interplay between several physical phenomena that need to be understood, measured and modelled. The modelling work will involve extensive collaboration with other partners of the project, both from industry and from research center, with diverse background, which enabling the PhD candidate to also develop her/his interdisciplinary skills.

Requirements

- Master’s degree or equivalent in Mathematics, Physics, Chemistry, Engineering, or related fields.
- Strong mathematical background is essential
- Basic knowledge in two or more of the following fields: Numerical modelling, Finite element, electrochemistry, lithium-ion battery, materials science, composite cathodes, solid-state batteries
- Good interpersonal and collaborative skills
- Experience of computational algorithm development and coding experience (C/C++, Python, ...) will be advantageous.
- Excellent written and spoken communication skills in English
- Previous experience with finite element software (e.g., COMSOL, FEniCS...) will be advantageous.
Benefits

- A PhD scholarship position (100%) for a period of 4 years. Starting with a maximum of 1-year as trial period. The salary is approximately 1900-2100 Euros/Month.
- A challenging, dynamic and stimulating work in an internationally renowned research group.
- A multicultural and international work environment.
- An international network dealing with state-of-the-art research.
- Working and living in Brussels, the Capital of Europe, one of the most cosmopolitan cities of the world. A vibrant and charming city, which combines history, modernity, arts and gastronomy.

Contacts

The interested candidates should send a single PDF file containing the candidate’s motivation letter, CV, publication list (if any) and academic track record (transcript and diploma) to:

Prof. Dr.ir. Annick Hubin (Annick.hubin@vub.be)
Dr.ir. Mesfin Haile Mamme (mmamme@vub.be)

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