



Job Posting

Recruiting organisation

Fraunhofer Institute for Chemical Technology (ICT)

Subproject title

Microwave electrode carbonization and surface functionalisation

Starting date

1st April 2026 (or earlier if preferred)

Salary

The Doctoral Network "SPACER" is financed by the European Union under the framework of the program HORIZON Europe, Marie Skłodowska-Curie Actions. The doctoral candidate will be hired for 36 months under contract by Fraunhofer ICT, with a monthly gross salary of approx. 3900 € (including mobility allowance, but excluding other allowances that depend on eligibility, e.g. family allowance, special needs allowance).

Background Information

Marie Skłodowska-Curie Doctoral Networks are joint research and training projects funded by the European Union. Funding is provided for doctoral candidates from both inside and outside Europe to carry out individual project work in a European country other than their own. The training network "SPACER" is made up of 21 partners, coordinated by Fraunhofer ICT in Germany. The network will recruit a total of 17 doctoral candidates for project work lasting for 36 months.

SPACER aims to develop new architectures for porous electrodes to improve the power density and energy efficiency of redox flow batteries (RFB), enabling affordable and durable long-duration energy storage. The approach is to use hierarchical structures, i.e. complex material layers that can be optimized to specific battery chemistries and flow phenomena from the microscale up. The developed technologies will be validated in half-cells and full working batteries at industrial partners at TRL 6.

Our objectives

- Multiscale **modelling** to better understand RFB behavior and identify optimal hierarchical shaped pore- and electrode-structure to encounter optimum electrolyte as well as electrical flow.
- **Prototyping** of the identified structures via stereolithographic, 3D printing and textile techniques like tufting, machine-based embroidery techniques or non-interlaced 3D pre-forming.
- Development of **advanced imaging and characterization technologies** (X-ray micro tomography, EPR imaging and spectroscopy) to evaluate performance of electrodes and to map electrolyte chemical composition in micrometer resolution, allowing validation of the model predictions.
- **Validation and evaluation** of the RFBs with optimized hierarchical electrodes.

Job Description

The advertized subproject is fully funded by the Marie Skłodowska-Curie European Training Network "SPACER". It will be carried out by one doctoral candidate at Fraunhofer ICT, (PhD supervision at Universitaet Innsbruck in Austria) over a period of 36 months.

The Fraunhofer Institute for Chemical Technology ICT, located in Pfinztal near Karlsruhe, is one of approximately 75 Fraunhofer institutes in Germany. Its Department of Polymer Engineering focuses on research related to microwave heating and plasma technologies for industrial processes. The microwave and plasma group has over 30 years of experience in high-temperature microwave processes for e.g. carbonization and graphitization of polymer materials. In the field of plasma, the group has developed plasma sources and processes for surface modification and plasma-assisted synthesis. The investigations and developments span from laboratory scale to demonstrator scale.

The goal of the doctoral thesis is to develop efficient energy processes for carbonization and graphitization of electrodes with microwaves and the comparison with conventional processes. Plasma



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processes will be investigated to activate and modify the surface of the electrodes, which enhances battery performance based on process gases and other carbonization parameters.

The recruited researcher will investigate the influence of microwave field modes and process parameters (such as time, microwave power, and frequency) on the degree and structure of carbonization and graphitization of the electrodes, aiming to reduce battery costs through process optimization. Additionally, the effects of various microwave plasma sources and processes on the surface of the carbonized electrodes will be examined. The developed procedures will be scaled up to test the modified materials in laboratory cells, specifically battery prototypes.

Benefits

The recruited researcher will have the opportunity to work as part of an international, interdisciplinary team of 17 doctoral candidates, based at universities and industrial firms throughout Europe. She/he will be supported by two mentors within the SPACER project, and will have multiple opportunities to participate in professional and personal development training. Through her/his work she/he will gain a unique skill-set at the interface between modelling and prototyping of electrode materials, characterization of electrodes using spectroscopical and electrochemical techniques at different levels from micro-scale to macro-scale.

She/he is expected to finish the project with a PhD thesis and to disseminate the results through patents (if applicable), publications in peer-reviewed journals and presentations at international conferences.

At our organization, we prioritize a supportive and flexible work environment that fosters a healthy work-life balance. We offer flexible working hours and remote work options, allowing our employees to tailor their schedules to meet personal and family needs.

Requirements

Qualifications/experience

- In accordance with the European Union's funding rules for doctoral networks, applicants must NOT yet have a PhD
- Very good master's degree in physics, material science, electrical engineering or a related discipline
- Familiarity with instrumental techniques in microwave and plasma, surface characterization, structural analysis or physics (microwave technology is an advantage)
- Experience and interest in working in a physical/chemical laboratory, in a cross-disciplinary, collaborative project
- Willingness to cooperate with project partners, who perform modelling and data management, to report results in conferences and project meetings.
 - Self-motivation, well-structured working style as well as ability to contribute effectively to the team.
 - Fluency in English (German is beneficial)

Mobility

The applicant must not have resided or carried out her/ his main activity (work, studies etc.) in Germany for more than 12 months in the past 3 years.

How to apply

Please send your CV by e-mail (preferred) or by post, quoting the reference SPACER-DC2-ICT.

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Application deadline: 14th October 2025