

Biobased electrodes and their functionalization via tailored precious metals deposition

Supervisors: Prof. Mari Lundström and Prof. Jaana Vapaavuori

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We are now looking for a **Doctoral Researcher in Metal Coated Bio-based Functional Materials**.

We are now looking for a doctoral researcher for metal coated bio-based functional materials research at Aalto University's Department of Chemical and Metallurgical Engineering in the School of Chemical Engineering ([CMET](#)). The work will be conducted in close collaboration also with Department of Chemistry and Materials Science ([CMAT](#)). The School of Chemical Engineering advances sustainable solutions and breakthroughs for bio- and circular economy by scientific and engineering excellence through multidisciplinary and industrial relevance. In this position you will have the opportunity to make an impact by developing processes for creating bio-based electrodes and achieving their functionalization using critical metals extracted from industrial side streams. There are vast amounts of both bio-based and mineral-based secondary raw materials that are currently overlooked or underutilized. In this research we aim to innovatively combine the use of these side-streams. The objective is not only to reuse these materials but to produce value-added products. More specifically, we create conductive electrodes from bio-based raw materials, such as lignin, and then deposit critical metals on them from hydrometallurgical side- and waste-streams: we aim to recover metals that are currently often neglected. By this strategy, the capture of critical and precious metals from side-streams can be improved, and even enabling direct utilization in electrode manufacturing and functionality. We are working towards creating functional surfaces in targeted applications such as photo- and electrocatalysis. Join us in shaping the future!

Scientific environment

The research will be carried out in the Hydrometallurgy and Corrosion (Hydromet) group, led by Prof. Mari Lundström in close collaboration with Multifunctional Materials Design (MMD) group, led by Prof. Jaana Vapaavuori. Hydromet applies hydrometallurgical and electrochemical means for the recovery of metals and precious materials, development of electrolysis processes, study of corrosion properties and development of new materials from secondary raw materials. MMD focuses on innovative strategies of combining multiple functionalities in one material and has already acquired a long-standing experience of employing biowaste-based material streams. Your project will build on prior work done in EarMetal project, founded by Research Council of Finland. The laboratories are located on the main campus of Aalto University in Otaniemi, Espoo. Our facilities are well suited for the electrochemical characterization and preparation of materials and coatings. RAMI Raw Materials research infrastructure also supports the research on metallurgical and hydrometallurgical processes and inorganic materials. Its target is to strengthen the long-term core expertise in Otaniemi (together with GTK and VTT), for natural and new inorganic material research needed in the circular economy.

In the first weeks, you will be assigned your own onboarding buddy who will help you get started with your work and studies at Aalto.

Your role and goals

The research work involves design and fabrication of bio-based electrodes and metallic functionalization. You are expected to participate in:

- Developing fabrication methods for mechanically robust conductive bio-based materials

- Establish procedures for metallic functionalization on bio-based materials directly from secondary raw materials
- Implementation of the target applications on the created bio-based functional materials
- Dissemination of results through scientific articles and presentations at conference, seminars, and workshops
- Taking an active role in teamwork and multidisciplinary collaboration

Your experience and ambitions

- A keen interest to work in the lab, learn how to build your own instruments, perform your own experiments, and analyze your results.
- Good student track records
- Ability to tolerate imperfection and failures (which are inherent parts of any research work) and still drive for improvements in technology development and research
- Strong motivation with a determined focus on achieving goals and completing tasks efficiently
- Ability to promote own research topic and adhere to schedules
- Willingness to learn new things and learn from others in the organization filled with high-level professionals

An applicant must have completed by 31 July 2024 or preferably earlier (to start employment on 1 August 2024) or by 31 December 2024 or preferably earlier (to start employment on 1 January 2025)

- a master's degree awarded by a university, or
- a study programme that in the awarding country gives eligibility for doctoral level studies

in Chemistry, Material Science, Metallurgy, or a closely related field. A good command of English is required, Finnish language is not.