

## Development of lignin-based surfactant systems

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### Summary

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*This 4-year PhD position is offered to work on the valorisation of bioresources through developing novel lignin-based materials. The PhD project will be devoted to the development of „green“ synthetic routes towards sustainable lignin-based surfactants and comprehensive study of the novel surfactant systems and formulations.*

Research field:	Chemistry and biotechnology
Supervisors:	Yevgen Karpichev Dr. Tiit Lukk
Availability:	This position is available.
Offered by:	School of Science Department of Chemistry and Biotechnology
Application deadline:	Applications are accepted between May 03, 2021 00:00 and May 31, 2021 23:59 (Europe/Zurich)

### Description

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Renewable resources, their use and modification are involved in a multitude of important processes with a major influence on our everyday lives. In this respect, renewable resources are a crucial area in the search for alternatives for fossil-based raw materials and energy. Developing the „green routes“ to the advanced surfactants via green building blocks is then an important task for the future. Lignin has great potential for use as a surfactant given its hydrophobic aromatic configuration.

The synthetic routes to the functionalization of this material have been extensively studied recently, and processes leading to the development of lignin-based surfactants are expected to include derivatization by grafting functional groups. The novel surfactants are expected to be readily biodegradable (to pass OECD Closed Bottle Test), possess low aquatic toxicity and designed considering the Green Chemistry principles.

The goal of this multidisciplinary PhD project is to develop novel surfactants systems and functional materials containing cationic and/or zwitterionic surfactants based on lignin and lignin-based products. The comprehensive aggregation properties study (determination of solubility, Krafft temperature, hydrophilic-lipophilic balance values, critical aggregate concentrations, zeta potential, characterization of size and shape of micelle/vesicle/ microemulsion/ colloid nanoparticles, etc) will be followed by testing biodegradability and studying properties of novel materials.

#### Qualifications:

- a university degree within a related field and a good background in at least one of the following area: organic chemistry, colloid chemistry, bioresource technology
- skills in organic synthesis and/or formulation analysis are desirable
- good knowledge in spoken and written English

#### Applicants should fulfil the following requirements:

- good cooperation ability, creativity and scientific curiosity
- be ready to supervise Bachelor's and Master's scientific projects
- innovative mind or willingness to gain innovation skills
- readiness to perform short-term scientific missions with collaborators' teams abroad
- willing to master new techniques and methods



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