

## Lignin-based surfactant systems

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### Summary

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*TalTech School of Science, Department of Chemistry and Biotechnology offers a 4-year PhD position in chemistry.*

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| Research field:       | Chemistry and biotechnology   |
| Supervisors:          | Yevgen Karpichev<br>Dr. Tiit Lukk   |
| Availability:         | This position is available.   |
| Offered by:           | School of Science<br>Department of Chemistry and Biotechnology  |
| Application deadline: | Applications are accepted between November 16, 2020 00:00 and December 16, 2020 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 are well established, and processes leading to the development of lignin-based surfactants are expected to include degradation and/or 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 PhD project is to develop surfactants system containing cationic and/or zwitterionic surfactants based on lignin and lignin-based products and their mixed surfactant systems with conventional surfactants and biodegradable surface-active ionic liquids. 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) and is expected to be followed by biodegradability test.

#### Qualifications:

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

#### The applicants should fulfill the following requirements:

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



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