

Sustainable Production of Bioplastic with the help of Microalgae

Project description

Plastic pollution is one of the major environmental threats facing our planet. The development of biodegradable plastic materials is a solution to this global environmental challenge. One of the most promising bioplastics is polyhydroxyalkanoate (PHA), a non-toxic polymer able to degrade into water and CO₂ without leaving any toxic byproducts; PHA is naturally synthesized by several specialized bacteria. Unfortunately, high production costs limit PHA's commercial implementation, the cost of the bacterial feed being the most significant (up to 50%). **The aim of this Master thesis is to investigate the potential of microalgae as feedstock for bacterial PHA production.** Microalgae are microscopic, photosynthetic organisms, which use the sun as energy source to convert CO₂ into carbohydrates and therefore offer cheap and sustainable carbohydrate production. We have a collection of microalgal strains, which produce high amounts of carbohydrates, when grown in wastewater and flue gases. We therefore link the sustainable production of carbohydrates with wastewater reclamation and carbon sequestration.

Microalgae are surrounded by a thick cell wall, which complicates extraction of the cell content. In your Master thesis you will develop and evaluate cell breakage and extraction methods in lab scale in view of their sustainability and their possibility for upscaling to industrial scale. The microalgal carbohydrates then will be fed to different PHA-producing bacterial strains and you will evaluate the optimal strain based on its capacity to grow and produce PHA.

The PHA will later be used by our industrial partners to produce packaging materials and furniture.



Research group/environment

Professor Christiane Funk's research group is investigating the potential of Nordic microalgae in wastewater reclamation and biomass generation. Besides being a group of excellence affiliated to WISE, she is part of the strategic research environment Bio4Energy and Umeå University's prioritized research area North Food. The group is in the Chemical Biological Centre of Umeå University, which offers excellent scientific infrastructure.

To be conducted at: Department of Chemistry, Umeå University, Christiane Funk@umu.se

Level: A (Master, 30/45/60 hp/ECTS depending on program)

Examiner: XXX

Supervisor: XXX

Contact person: XXX (XXX@liu.se)