Development of xylanolytic *Saccharomyces cerevisiae* strains using CRISPR-Cas9 technology

Duration: 6-12 months (30 to 60 hp)

Placement: Division of Industrial Biotechnology in the Department of Biology and Biological Engineering, Chalmers

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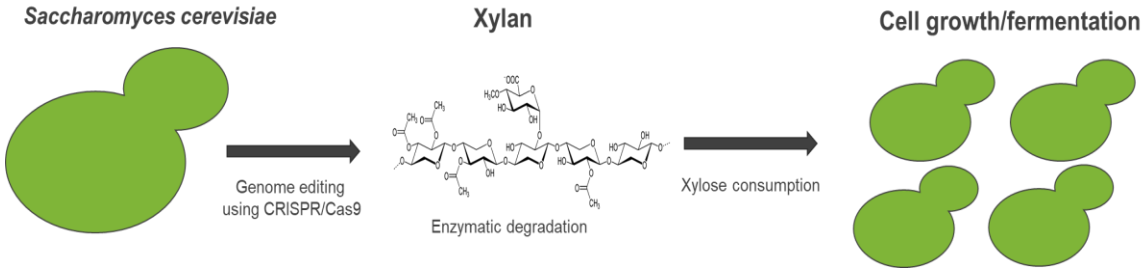
Background:
There is a worldwide growing interest in utilizing plant biomass as starting material for production of fuels, chemicals, and materials. The overarching aim of this project is to make better industrial use of the xylan fraction of plant biomass, which can comprise up to 35% of the total dry weight. In this master thesis project, you will work towards this aim by equipping the most important yeast cell factory in biotech - *Saccharomyces cerevisiae* - with the capacity to degrade and ferment xylan into products. Here, you will first use the state-of-the-art genome editing tool CRISPR/Cas9 to engineer industrial strains of *S. cerevisiae* to express enzymes that hydrolyses xylan into the monomeric sugar xylose. You will then determine the capacity of the new strains to ferment xylan and xylose into product. This work is part of an H2020 EU project, which gives you the opportunity to join a large international consortium and collaborate on a highly interdisciplinary project.

The Aim of the Master Thesis project is to construct xylanolytic *S. cerevisiae* industrial strains expressing hemicellulases (xylanase and β-xylosidases). The genome editing technology CRISPR/Cas9 will be applied to develop strains for industrial/commercial application.



Methods that will be used in the project:

1) Molecular biology techniques (PCR, cloning, gene deletions, DNA amplification and purification)
2) Microbiology techniques (culturing of cells using shake flasks and small-scale bioreactors, transformations, OD measurement and fluorescence microscopy)
3) Biochemical techniques (HPLC and enzymatic assays, e.g., DNS)

Learning outcomes:

1) Practical experience of yeast strain development for industrial applications
2) Knowledge and knowhow of CRISPR/Cas9 technology.
3) Utilization of equipments including fluorescence microscope, HPLC, spectrophotometer, small-scale bioreactors and BioLector for high-throughput growth and fermentation phenotyping.