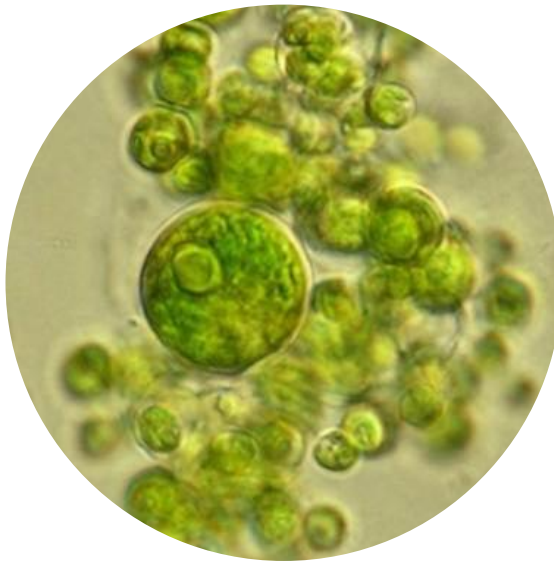


Proteins from micro- and macro-algae

Richard Postma

Supervisors: M. Eppink, M. Barbosa, W. Brandenburg, R. Wijffels



WAGENINGEN **UR**
For quality of life

Bioprocess Engineering

26th April 2013

Content

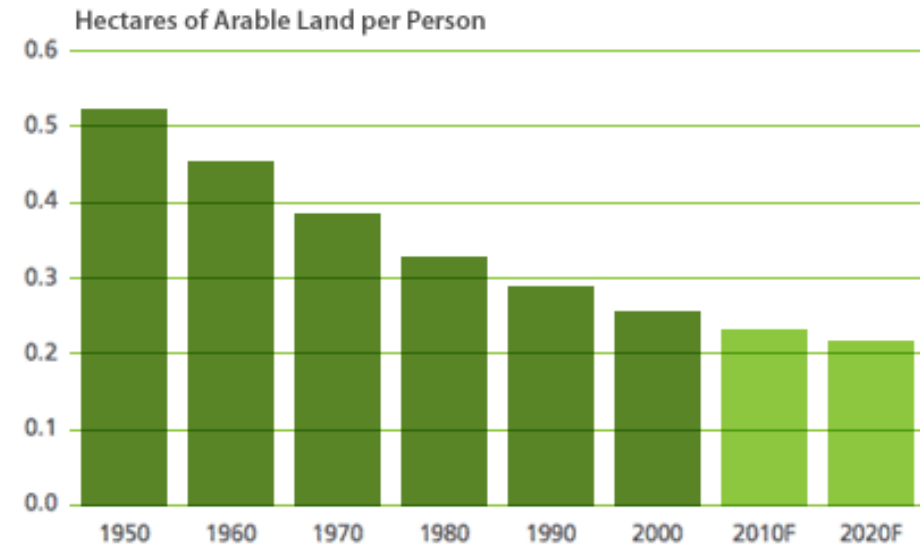
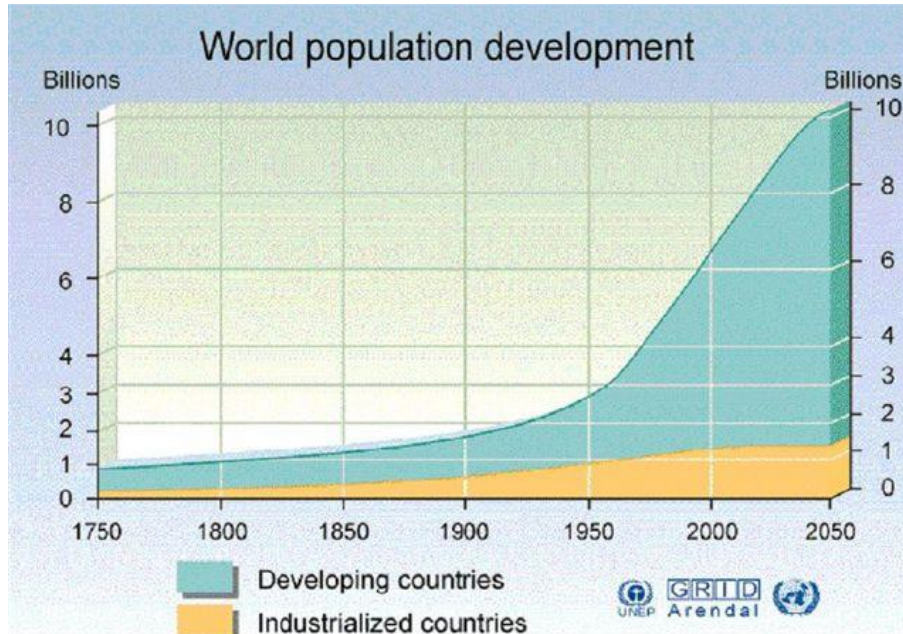
- Introduction
- Aim of PhD
- Approach
 - 1st half of PhD
 - 2nd half of PhD

Oil dependency...

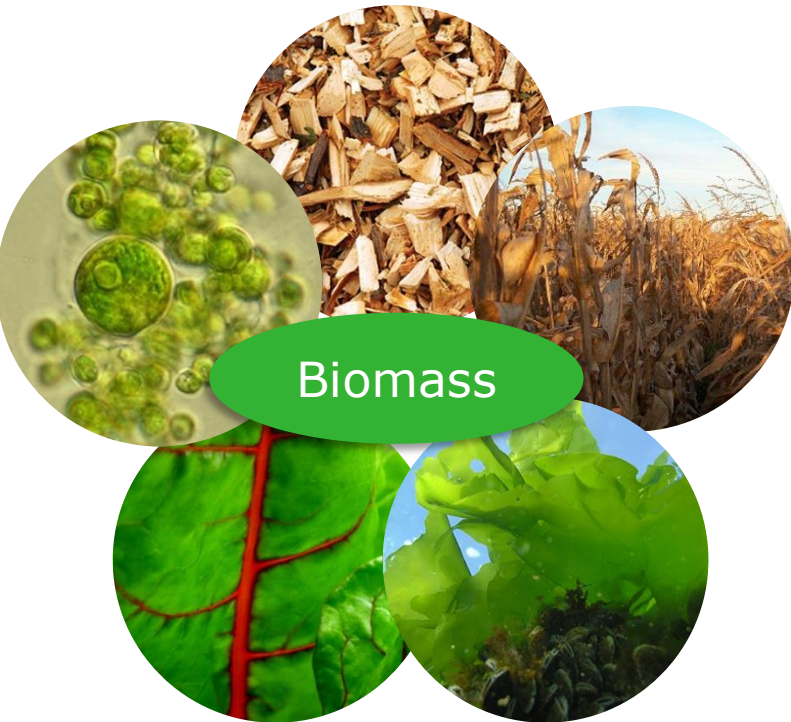


Diesel: € 0.50 L⁻¹ (1)

...and growing world population



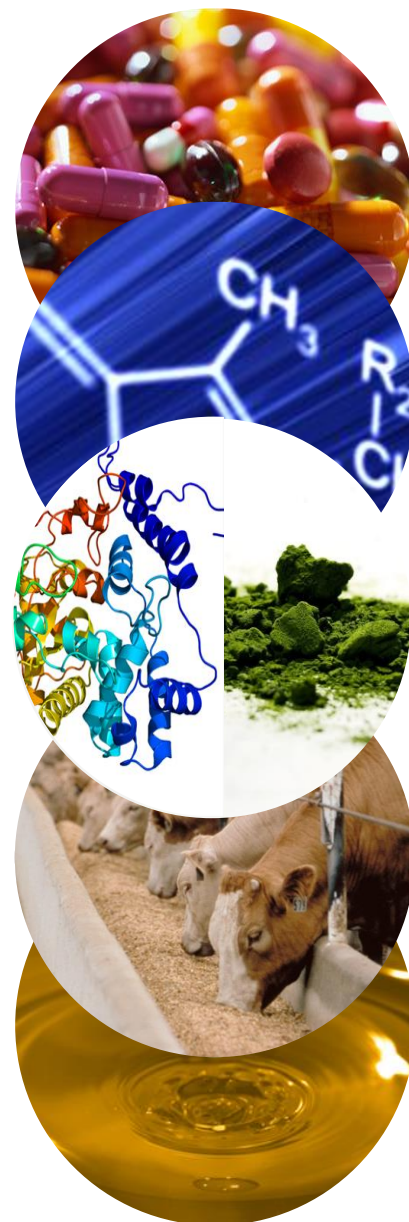
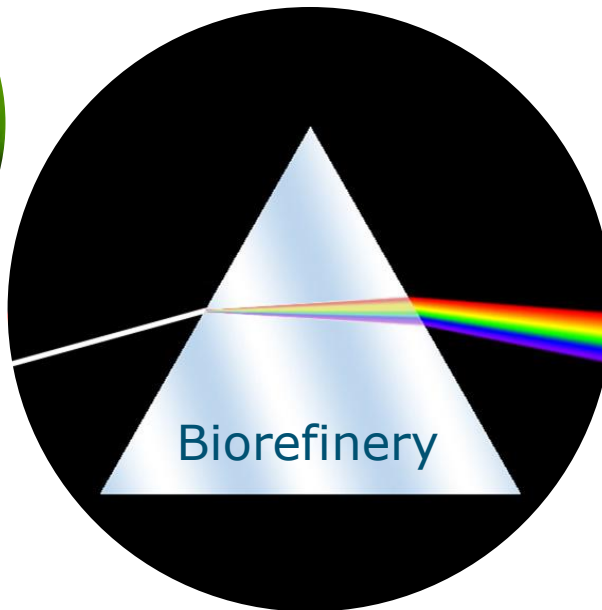
From Food or Fuel...



Biomass



... to Food and Fuel

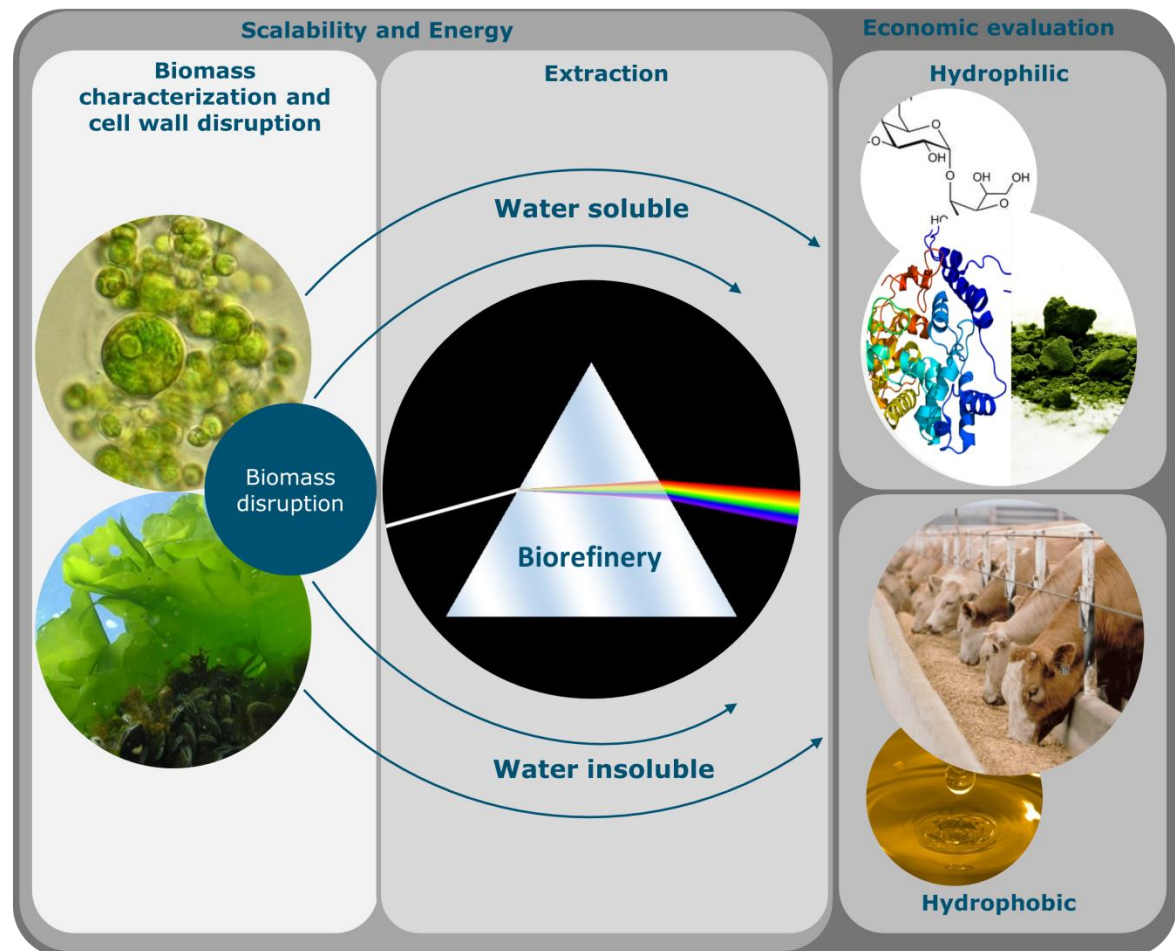


Green source composition

	Lipids (wt%)	Proteins (wt%)	Carbohydrates (wt%)
Macroalgae (<i>Ulva</i>)	5	20	40
Microalgae (<i>Chlorella</i>)	15	50	25
Microalgae (<i>Chlorella</i>) [N-stress]	50	15	25

Aim of PhD

- Development of a mild, continuous, scalable disruption and protein extraction technology with minimal energy requirements



Approach: Biomass

Macro-algae

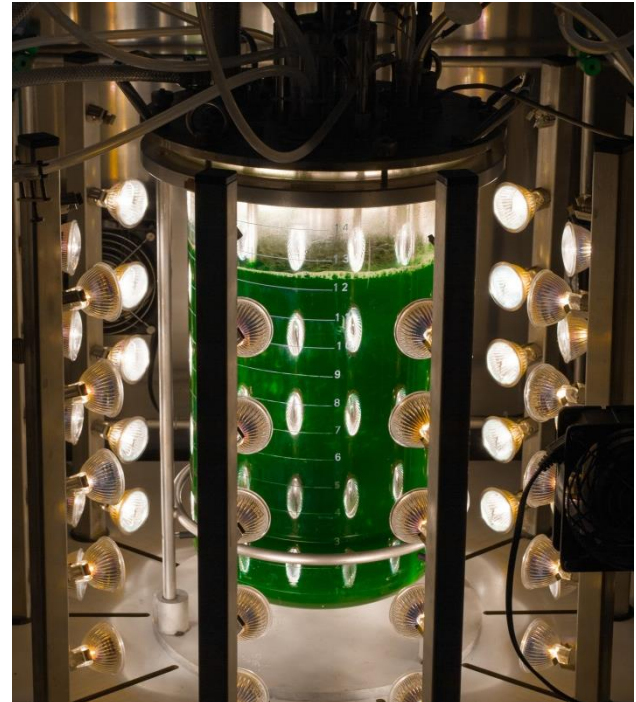
■ *Ulva lactuca*

- PRI; group of Willem Brandenburg
- Tanks in greenhouses at AlgaeParc

Microalgae

■ *Chlorella vulgaris*

- 15 L stirred tank reactor
- Repeated batch

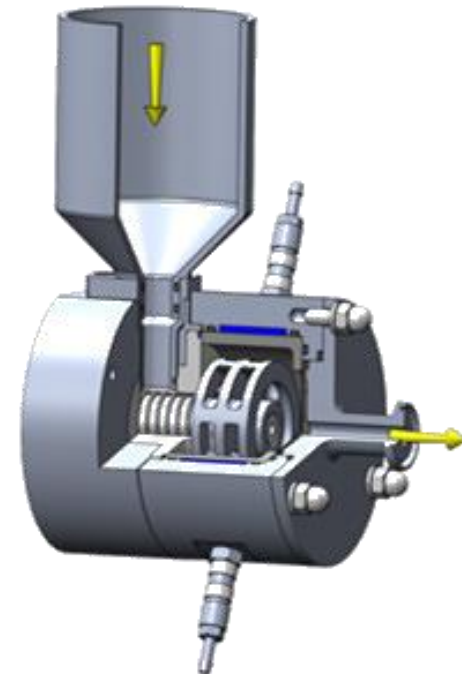


1st half PhD: Mild disruption technology

■ Bead milling

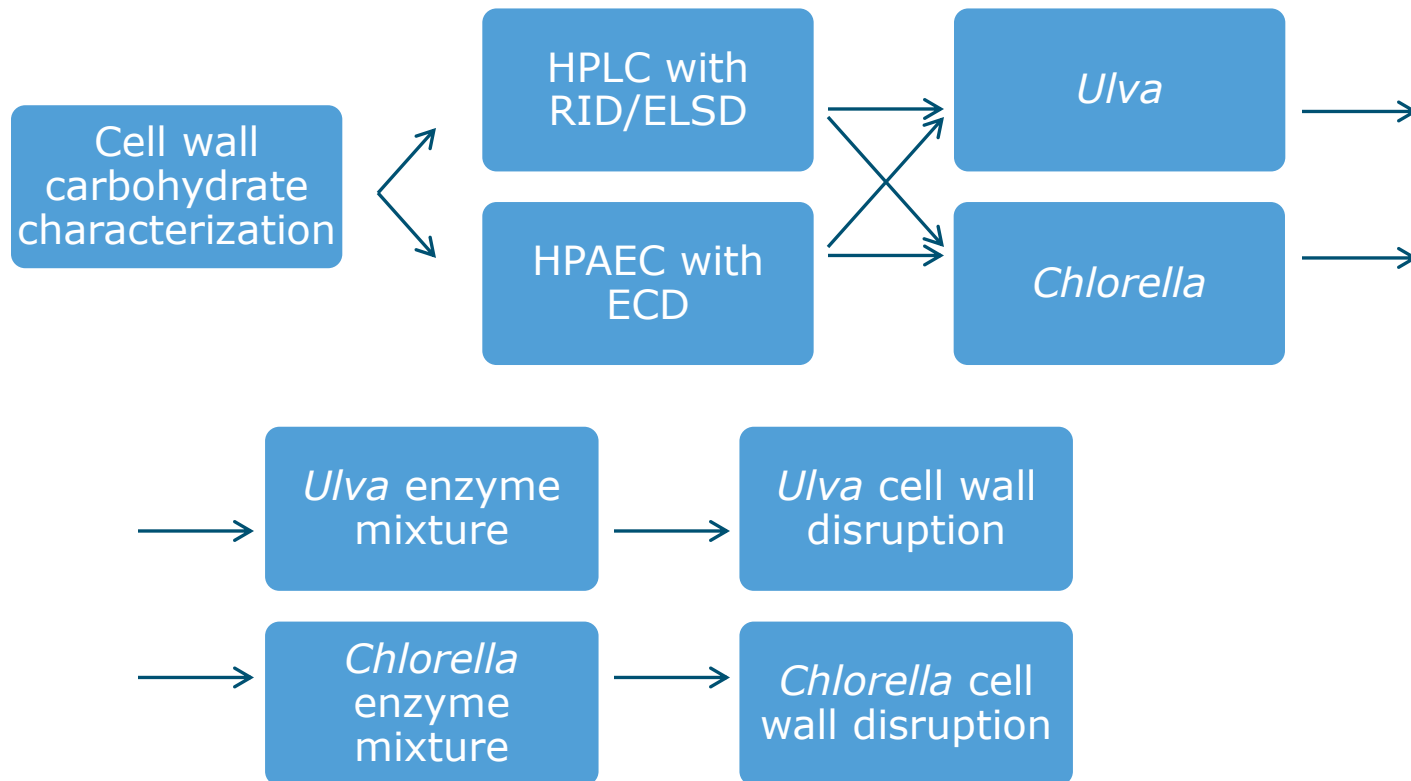
- Small scale (100 ml)
- Scalable

Particle size	X
Bead size	$\sim 8-10 * X$
<i>Chlorella vulgaris</i>	$\sim 3 \mu\text{m}$
Beads	$25-30 \mu\text{m}$



1st half PhD: Mild disruption technology

■ Enzymatic disruption



1st half PhD: Mild disruption technology

■ Pulsed Electric Field

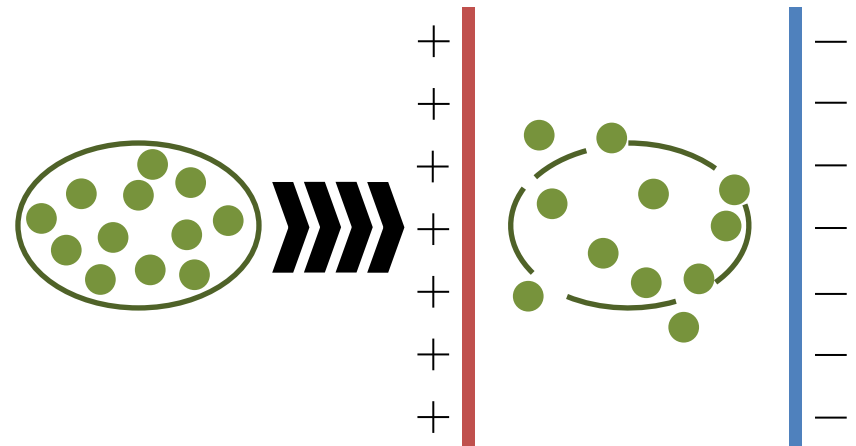
Parameters to be optimized

Biomass concentration

Electric Field strength

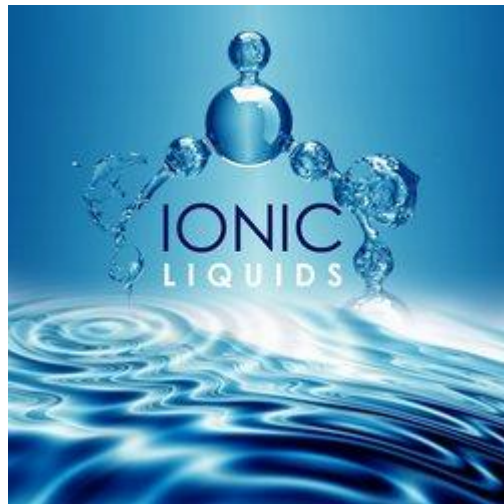
Exposure time to electric field

Conductivity of biomass

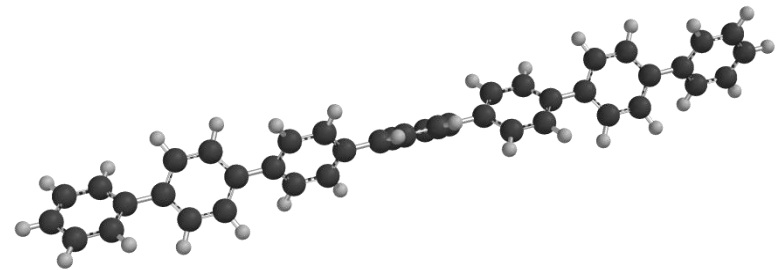


2nd half PhD

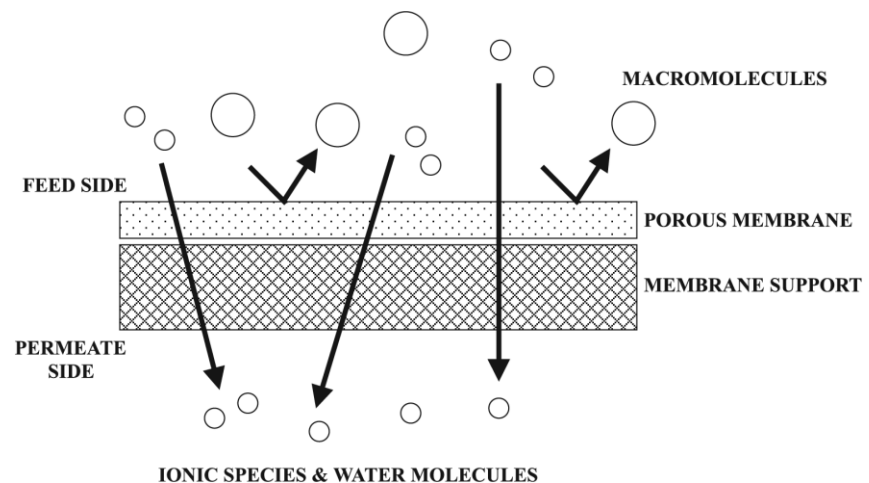
- Mild protein extraction
- Recovery of extractant
- Economical feasibility



Precipitation with polymers

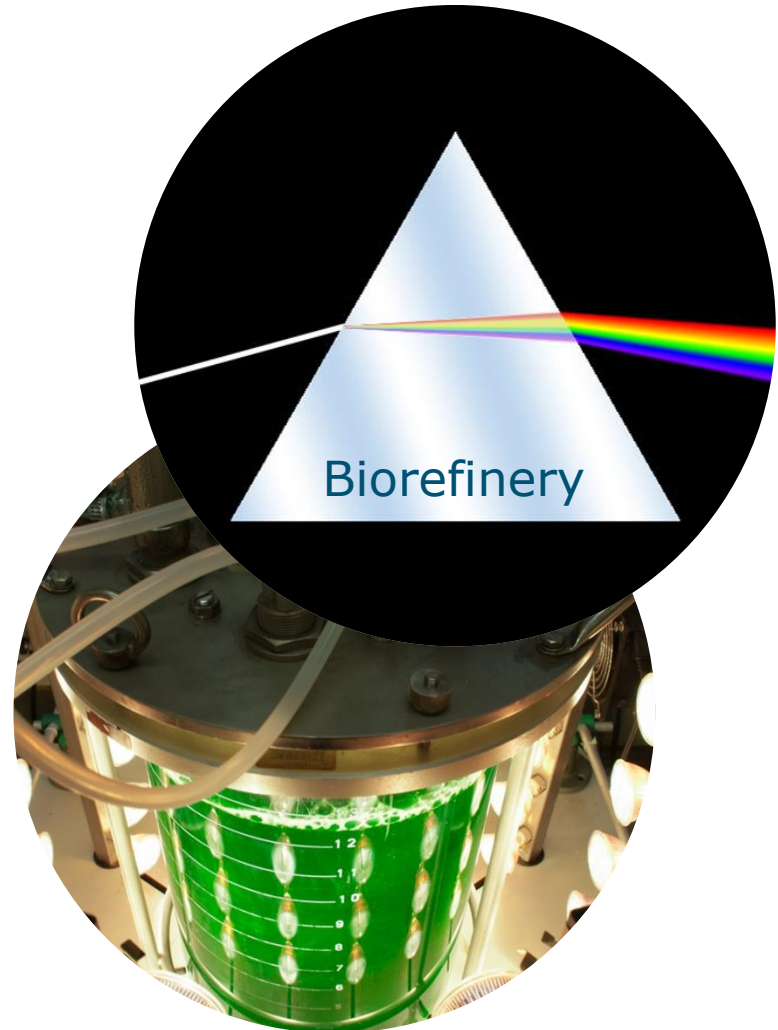


Ultrafiltration



Thank you for your attention

Are there any questions?



Acknowledgements:

This project is financed by the IPOP
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