



ADVANCED COURSE

# EPS for Resource Recovery

12 - 16 May 2025

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## AIM OF THE COURSE

The Advanced Course “EPS for Resource Recovery: from fundamentals to application” aims at introducing the state-of-the-art methodologies for the isolation, identification and characterization of EPS components with a special focus on the glycans that mediate cell-cell and cell-environment interactions; explain how to evaluate the genetic potential and uncover the regulation of the synthesis of EPS component; and complement with the product development based on the properties of EPS.

A substantial part (ca. 40% of the time) will be dedicated to hands-on exercises in teams of 3-4 participants with extensively applying and integrating instrumental analysis and bioinformatic tools. The lectures and hands-on exercises will be supplemented with a visit to the full-scale wastewater treatment plant using aerobic granular sludge technology (also known as “Nereda technology”), and one of the world’s first two demonstration-scale installations to extract EPS from Nereda® granules, which will provide the case-study of resource recovery from excess sludge.

## COURSE DESCRIPTION

This one-week course is intensive. To ensure active participation by those attending, a combination of theoretical (lectures) and practical work (lab experiments, exercises) is offered. Some online preparatory materials will be given to ensure all the participants have the same basic knowledge.

## LECTURES

The core lectures are mainly scheduled in the mornings and will focus on the following themes:

- EPS isolation and chemical characterization
- introduction to metagenomic analyses of microbial communities and exploring metabolic pathways in MAGs
- EPS physical property characterization
- EPS as a resource

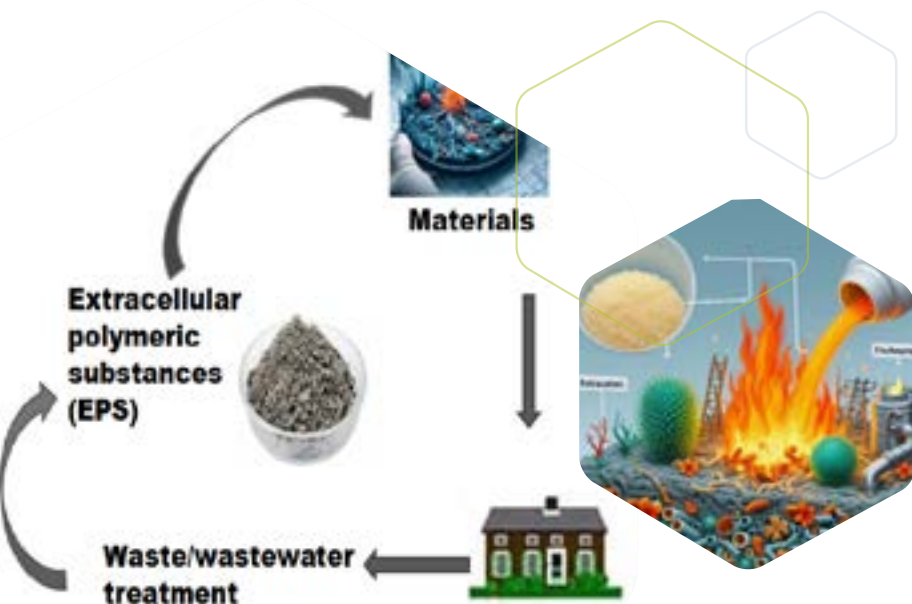
## LAB EXPERIMENTS AND EXERCISES

The hands-on exercises are scheduled in the afternoons and will focus on the following themes:

- EPS extraction
- Sugar monomer analysis by HPAEC-PAD
- Glycan visualization by lectin staining (sialic acids as one example)
- Functional groups analysis by FTIR and 2D COSY data treatment
- EPS NMR spectrum analysis
- Identification of glycans (including exopolysaccharides and sugar monomers) metabolic pathway and phylogenetic visualization of query genes using epsSMASH
- Particle size and settling velocity measurement and EPS rheology analysis
- Quick screening test towards EPS application

## WHO SHOULD ATTEND?

This Advanced Course is aimed at professionals (MSc, PhD or equivalent experience) in biotechnology, water sanitation, environmental engineering and chemical engineering with a working knowledge of chemistry and bioprocess. The course is primarily aimed at those who are already interested in the EPS research and developing EPS-related products, and who wish to update their theoretical knowledge and practical insight in this field.



## COURSE BOARD

Yuemei Lin  
Samarpita Roy  
Mario Pronk  
Environmental Biotechnology Section  
Department of Biotechnology  
Delft University of Technology  
Delft, the Netherlands

## TU DELFT

Ji Li  
Stefan de Bruin  
Stephen Picken  
Claire Chassagne

## COURSE COORDINATION

Yvonne van Gasteren  
Jenifer Baptiste  
BioTech Delft, Delft University of Technology  
Department of Biotechnology  
Delft, the Netherlands

## LECTURERS

Thomas Seviour  
Aarhus University  
Aarhus, Denmark

Amrita Bhattacharya  
Aarhus University  
Aarhus, Denmark

Morten Kam Dahl Dueholm  
Aalborg University  
Aalborg, Denmark

Nam Kyeun Kim  
Auckland University  
Auckland, New Zealand

Edward van Dijk  
RHDHV  
Amersfoort, the Netherlands

Patrick van der Velden  
Kaamera BV  
Zutphen, the Netherlands

# PROGRAM

## MONDAY 12 MAY 2025

Theme: EPS extraction and chemical characterization (I)

- 08:45** Registration
- 09:00** Introduction to the advanced course
- 09:15** Introduction of EPS and EPS chemical analysis  
*Yuemei Lin*
- 10:30** HPAEC-PAD for EPS sugar monomer analysis  
*Ji Li*
- 11:30** EPS visualization  
*Yuemei Lin*
- 12:30** Group picture & Lunch
- Lab**
- 13:30** EPS extraction
- 15:00** EPS hydrolysis for sugar monomer analysis by HPAEC-PAD
- 15:45** EPS sample preparation for FTIR
- 16:00** Sialic acids lectin staining and microscopy analysis
- 18:15** Recap of concepts
- 19:00** Social event

## TUESDAY 13 MAY 2025

Theme: EPS extraction and chemical characterization (II)

- 09:00** Individual EPS component analysis  
*Thomas Seviour*
- 10:15** Sample preparation for NMR analysis of exopolysaccharide from complex biofilms  
*Thomas Seviour/ Amrita Bhattacharya*
- 11:15** EPS flame-retardant property analysis  
*Nam Kyeun Kim*
- 11:45** Functional group analysis by FTIR and 2D-COS data treatment  
*Stefan de Bruin*
- 12:30** Lunch
- 13:30** How to read EPS NMR spectrum  
*Amrita Bhattacharya*
- 15:00** Genome-resolved metagenomics  
*Morten Kam Dahl Dueholm*
- 16:15** Exploring exopolysaccharide metabolic pathways in MAGs  
*Morten Kam Dahl Dueholm*
- 16:15** Exploring of query gene sequences in MAGs  
*Morten Kam Dahl Dueholm*
- 18:30** Recap of concepts

## WEDNESDAY 14 MAY 2025

Theme: EPS metagenomic approach

- 09:00** Introduction to metagenomic analyses of microbial communities  
*Samarpita Roy*
- 10:15** Phylogenetic visualization of query genes  
*Samarpita Roy*
- 12:00** Lunch
- Lab**
- 13:30** FTIR and data analysis
- 15:00** Sample preparation for HPAEC-PAD analysis and flammability test
- 16:30** HPAEC-PAD result
- 17:00** EPS flammability quick screening test
- 17:45** Recap of concepts

## THURSDAY 15 MAY 2025

Theme: EPS physical property characterization

- 09:00** Introduction to the rheology of EPS  
*Stephen Picken*
- 10:15** Introduction to flocculation between EPS and clay: size and surface charge characterization  
*Claire Chassagne*
- 11:30** Floc size evolution as function of shear, pH, salinity and aging of the EPS  
*Claire Chassagne*
- 12:30** Lunch
- Lab**
- 13:30** Measurements of sized and settling velocities of flocs
- 15:30** Rheology of EPS
- 17:15** EPS attachment quick screening test
- 18:15** Recap of concepts
- 19:00** Course dinner

## FRIDAY 16 MAY 2025

Theme: From Nereda to Kaumera - a case study of EPS recovery

- 09:00** Departure to Zutphen
- 11:00** From Nereda to Kaumera: experience of recovering EPS as a resource  
*Edward van Dijk & Patrick van der Velden*
- 13:00** Lunch in Zutphen
- 14:00** Plant tour
- 16:00** Certification & Back to Delft

### LOCATION

The course will be held at the  
Delft University of Technology  
Department of Biotechnology  
Van der Maasweg 9  
2629 HZ Delft, The Netherlands



## COURSE REGISTRATION

Please register via the website to attend the course. We can host a limited number of participants. A short motivation letter can be requested after registration, before we can confirm your participation.

## COURSE FEE

The course fee can be found on the [website](#). The fee includes course materials, lunches, the drinks on Monday and course dinner on Thursday. The fee does not cover other meals and lodging.

When the number of participants is too low to have a fruitful course, BioTech Delft will cancel the event no later than six weeks before the start of the course. The course fee will be reimbursed within three weeks after cancellation.

In case a speaker will not be able to present his/her lecture due to unforeseen circumstances, BioTech Delft will arrange an equivalent replacement.

The complete digital course book will be supplied at the start of the course.

**BioTech Delft** organises biotechnology education at postgraduate level. BioTech Delft closely cooperates with the department of Biotechnology of Delft University of Technology. Since its foundation, in 1987, BioTech Delft has very successfully organised various types of postdoctoral education.

Currently BioTech Delft offers Advanced Courses given each year, covering the multidisciplinary spectrum of biotechnology. The courses have a long track-record dating back to 1988.

- *Microbial Physiology and Fermentation Technology (1988)*
- *Downstream Processing (1989)*
- *Biocatalysis and Protein Engineering (1999)*
- *Bioprocess Design\* (2014)*
- *Modelling and Computation for Micro-organisms in Bioprocesses (2018)*
- *Multi-Omics approaches for Improvement of Industrial Microbes (2020)*
- *Cellular Agriculture: Precision fermentation and cultured meat (2024)*
- *EPS for resource recovery (2025)*
- *Biopharmaceutical Bioprocessing (2025)*

\* in partnership with Wageningen University & Research

## FURTHER INFORMATION

Jenifer Baptiste, BA

Course coordination

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