Bio Base Europe Pilot Plant vzw – Stage-Internship (master/bachelor degree)

Below is a list of topics for which we have internship vacancies.

<u>**TOPIC 1**</u>

Capturing biogenic CO_2 into biobased intermediates through gas fermentation

Available from April 2026

<u>Project description</u>

Due to its adverse effects on our climate, the accumulation of CO2 in our atmosphere is and remains a serious challenge. Yet, where CO2 was previously considered a burden, it is now seen as a possible green resource for the synthesis of chemical intermediates and added-value compounds. This concept is known as carbon capture and utilisation (CCU) and can help to reduce CO2 emissions across industries. Industrial CO2 can be abiogenic, when it comes from fossil carbon, or biogenic, in case it originates from a natural resource. Because CO2 has a rather low energy, other energy sources are required for the organism, which come in the form of CO and/or H2.

This project will focus on producing acetic acid via gas fermentation on syngas or H2/CO2, using biogenic CO2. It will involve fundamental research to understand the workings of the organisms and the process. Based on this research, the process will be scaled to 1 L in four parallel gas fermenters at Bio Base Europe Pilot Plant. The process will be further intensified by means of cell recycle and the use of elevated pressures, aiming to improve the acetic acid productivity. As a final part, the downstream processing of acetic acid will be investigated to ensure that the stream can be used as a valuable carbon source for other liquid fermentation processes.

This project is framed within the EU-funded projects CAPTUS and FUELPHORIA, which focus on the transformation of biogenic CO2 into biochemicals and fuels in a truly renewable manner. You will get the opportunity to perform important fundamental research in the gas fermentation field and see how your research evolves into a process using state-of-the-art gas fermentation equipment in an industrial environment, with the final aim of developing an industrially relevant gas fermentation process.

This internship takes place at Bio Base Europe Pilot Plant (BBEPP), a non-profit SME that assists companies and research groups to bridge the gap between laboratory research and industrial implementation of their innovations. BBEPP is equipped with all process and analytical tools which allow to perform high-quality research in an industrial environment.

<u>**TOPIC 2**</u>

From lost fibres to sustainable bioplastics: upgrading industrial paper and cardboard waste streams

Available from April 2026

<u>Project description</u>

With an ever-increasing rise in demand for plastics, macro- and microplastics are increasingly being released into the environment. As a result, there has been a surge of interest in replacing conventional fossil-based plastics with biodegradable alternatives like polyhydroxyalkanoates (PHAs). To further enhance the sustainability of the production of these bioplastics, waste streams are targeted as a carbon source. In this respect, millions of tons of paper and cardboard waste are yearly incinerated in Flanders and the Netherlands. Yet, these unrecyclable reject streams contain over one million ton of valuable fibres that can be used in circular applications like bioplastic production.

The FibreSave project aims to upcycle these lost fibres into sustainable, biodegradable plastics.

This internship will focus on the saccharification and fermentation of true industrial paper and cardboard waste streams to produce PHA bioplastics. The specific objectives include:

Optimisation and scale-up of the saccharification process for paper and cardboard waste streams to yield kg-scale fermentable sugars with high cost-efficiency.

Development of a scalable fermentation process in state-of-the-art bioreactors, optimising key process parameters such as pH, aeration, and feed composition. Different feed strategies and fermentation modes like fed-batch and continuous will be investigated and the challenges of working with waste-derived feedstocks will be tackled.

Assessment of downstream processing (DSP) technologies to recover purified PHA materials from the microbial biomass.

This internship frames within the EU-funded FibreSave project and takes place at Bio Base Europe Pilot Plant (BBEPP), a leading institution that assists companies and research groups to bridge the gap between laboratory research and industrial implementation of their innovations. BBEPP is equipped with advanced process and analytical tools that will facilitate high-quality research in an industrial environment, in collaboration with an experienced team of researchers and engineers.

TOPIC 3

Development and scale-up of sustainable downstream processing strategies for SAF precursors

Available from May 2026

Project description

The pursuit of Sustainable Aviation Fuel (SAF) has become a cornerstone of the transition towards a greener aviation industry. As part of this overarching goal, this project focuses on the development and scale-up of innovative downstream processing (DSP) strategies for the sustainable recovery and purification of SAF precursors. These strategies aim to enhance industrial relevance while minimizing environmental impact.

The specific objectives of this internship position include:

Development of Sustainable DSP Strategies: Innovate and optimize downstream processes to recover SAF intermediates with a focus on sustainability. This involves designing and testing various DSP techniques to maximize recovery efficiency.

Evaluation of Technologies and Process Conditions: Assess multiple DSP technologies and operational conditions to determine their performance in terms of recovery rates, energy consumption, and material requirements. This step is crucial for identifying the most effective and sustainable methods.

Benchmarking Green Solvents: Compare the use of green solvents against traditional extraction systems. This involves evaluating the efficacy, cost, and environmental impact of green solvents in the DSP of SAF precursors.

Solvent Recycling for Process Intensification: Investigate the feasibility of recycling solvents within the DSP framework to enhance process efficiency and industrial viability. This includes optimizing conditions for solvent reuse without compromising recovery performance.

This research will be conducted at Bio Base Europe Pilot Plant (BBEPP), a leading institution known for bridging the gap between laboratory research and industrial application. BBEPP is equipped with advanced process and analytical tools that will facilitate high-quality research in an industrial environment.

<u>TOPIC 4</u>

Hybrid process development for upcycling mixed plastic waste into high-value dicarboxylic acids

Available from August 2026

<u>Project description</u>

The HYBRID project aims to address two major challenges: the incineration of difficult-to-recycle plastic waste, leading to CO2 emissions, and the fossil-based production of virgin plastics from long-chain dicarboxylic acid (DCA) monomers. By integrating pyrolysis, biological funnelling, fermentation, and advanced product recovery techniques, the project seeks to convert mixed plastic waste into high-value DCAs, critical for producing textile polymers, polyesters, lubricants, and plasticizers.

This internship, part of the HYBRID project, focuses on upcycling plastic waste into DCAs using a yeast-based fermentation platform. Key tasks include:

Fermentation Process Development: Investigate and optimize the fermentation behaviour of engineered strains with varying waste-derived feedstocks.

Biphasic Fermentation: Develop an advanced, multi-phase fermentation process with *in situ* product recovery and resource recycling.

Process Integration and Scale-Up: Transfer and evaluate the developed process at bioreactor scale and boost the process performance by in-depth optimisation. Collaborate with engineers to scale up the optimized process.

This internship at Bio Base Europe Pilot Plant (BBEPP) offers hands-on experience in fermentation and downstream purification technologies and supports the transition to a circular bio economy. All experimental work will be performed in the industrial environment of BBEPP using state-of-the-art equipment, in cooperation with a team of experienced professionals. Your work will contribute to the Flemish-funded HYBRID project, crucial for further development and industrial scale-up.

<u>TOPIC 5</u>

Production of sustainable microbial proteins within a seaweed biorefinery

Available from August 2026

<u>Project description</u>

Current food systems and agricultural practices, in particular livestock production its dependency on soy imports, are under pressure because of their environmental impacts of which land use and greenhouse gas emissions are a major concern. As a result, there is an urgent need to develop high-quality proteins in a sustainable manner. Seaweed provides a versatile and nutritious source of proteins for food and feed applications. Moreover, there is high potential in the Belgian part of the North Sea to establish and operate commercial seaweed cultivation systems, e.g., in combination with offshore wind turbines. In this context, the SUPROSEA project aims to establish a sustainable seaweed biorefinery to produce high-quality proteins in an economically feasible manner.

This internship project frames within the SUPROSEA project and the Flemish Protein Strategy. The primary objective is to explore and develop biotechnological strategies for seaweed and seaweed residues in a zero-waste biorefinery approach. Particularly, it aims at the production of microbial protein via fermentation with maximal carbon efficiency. A first part will focus on the development of an efficient pre-treatment and saccharification process for seaweed biomass to yield suitable fermentation feedstocks. Then, different types of seaweed feedstocks and their carbohydrates will be screened for fermentability. For the most interesting types of seaweed feedstocks, a fermentation process will be developed and fine-tuned towards industrial performance levels. To this end, different process set-ups and feeding strategies (batch, fed-batch, repetitive fed-batch, multi-stage fermentations) will be explored and key fermentation parameters (pH, temperature, aeration) will be optimized to maximize productivity and yield. Finally, industrial downstream processing techniques will be evaluated to yield seaweed-based microbial proteins for testing in food and feed by the project partners.

This research will be conducted at Bio Base Europe Pilot Plant (BBEPP), a leading institution known for bridging *the gap between laboratory research and industrial application. BBEPP is equipped with advanced process and analytical tools that will facilitate high-quality research in an industrial environment.*

TOPIC 6

An industrial fermentation and DSP platform to transform 2G streams into bioplastics, biochemicals, and microbial proteins

Available from August 2026

Project description

The Flemish CUPRO project is aimed at tackling two major challenges in current society: fossil-based plastics and unsustainable protein production. For this, it focuses on the simultaneous production of bio-based plastics (polyhydroxyalkanoates, PHAs) and single cell protein (SCP) via fermentation of a wide variety of second-generation feedstocks. PHAs are biodegradable and biocompatible polyesters with potential applications in food packaging and medical and pharmaceutical products, whereas SCP is a promising alternative to traditional plant-based proteins in food and feed.

In this internship, an multi-stage fermentation process will be developed and linked to a high-efficiency downstream protocol to simultaneously produce high-purity PHA and SCP. Firstly, the robustness of engineered bacteria to convert 2G carbohydrates will be evaluated using a wide range of industry-sourced 2G feedstocks. Then, the impact of fermentation parameters, including pH, temperature, and medium composition, on microbial growth, biopolymer production, and protein content will be investigated.

In addition, green solvents will be evaluated for sustainable recovery of PHA. For the most promising extractants, the impact of extraction conditions will be investigated, including extraction time, temperature, and solvent ratio. Pre-treatments aimed at cell disruption of the microbial biomass will also be considered to improve the extraction efficiency and enable simultaneous recovery of high-purity PHA and SCP. Finally, solvent recycling and re-use will be briefly evaluated to enhance the economic and industrial feasibility of the overall process, as well as its sustainability.

This research will be conducted at Bio Base Europe Pilot Plant (BBEPP), a leading institution known for bridging the gap between laboratory research and industrial application. BBEPP is equipped with advanced process and analytical tools that will facilitate high-quality research in an industrial environment.

TOPIC 7

Development of the fermentation and downstream processing to produce protein nanofibrils, a precursor for sustainable textile materials

Available from August 2026

Project description

A novel class of protein nanofibrils was discovered, showing promising properties regarding chemical and tensile durability. These nanofibrils are produced in bacterial fermentations, and protein engineering enables the introduction of new functionalities. They can be further processed to obtain an engineerable textile material, called "sporesilk". Apart from a completely new type of textile material, this offers a more sustainable alternative to fossil-based textile materials used today.

In framework of the Flemish HiPProFib project, the objective is to develop an industrially relevant fermentation process where these nanofibrils are produced in a cost-efficient manner. Within this project, different fermentation parameters, medium compositions, feed rate strategies, and the use of second-generation feedstocks will be investigated. Following the production process, product purification is key. The first steps towards a challenging product purification will be investigated within this internship. The aim is to achieve effective purification using sustainable processing strategies and without compromising their intrinsic characteristics.

This internship will take place at Bio Base Europe Pilot Plant, a leading institution known for bridging the gap between laboratory research and industrial application. BBEPP is a state-of-the-art facility, with a wide and flexible range of modular unit operations to enable high-quality research.

Which student profile do we require?

Requirements are:

- You are studying for a degree in bio-engineering or related (bioprocessing, chemistry, biotechnology, cell- and gene technology) for the master internship.
- You are studying for a bachelor degree (agro- en biotechnologie of voeding- en dieetkunde) for the bachelor internship.
- Some experience with bacterial, yeast or fungal hosts is an asset
- Some relevant experience with biocatalytic processes for the production of chemicals, food ingredients or cosmetics is an asset
- The duration of your internship is at least 6 months.

What do we offer?

We offer a dynamic, international and young working environment and a full learning experience. You are based at the Bio Base Europe Pilot Plant, situated in the port of Ghent in Belgium.

The internship runs for a minimum of 6 months fulltime to preferably a whole academy year fulltime.

https://www.bbeu.org/