BIOCOMEM

BIO-BASED **CO**POLYMERS FOR **MEM**BRANE END PRODUCTS FOR GAS SEPARATIONS

THIS PROJECT HAS RECEIVED FUNDING FROM THE BIO BASED INDUSTRIES JOINT UNDERTAKING UNDER THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT NO 887075

NEWSLETTER Nr. 2

30th May 2021

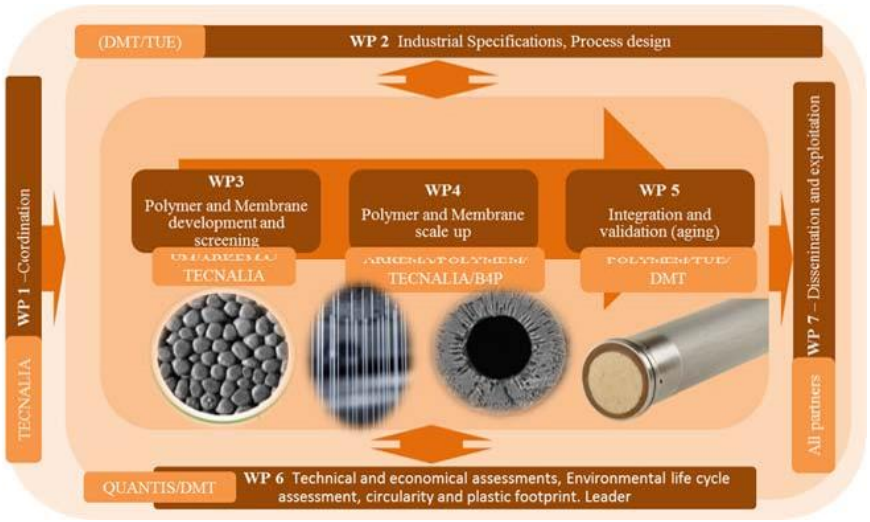
Editorial

Dear BioCoMem friends I am glad to welcome you to the second project newsletter! The last project meeting was held online in the first half of May, allowing all the consortium members to take stock of the situation.

As shown below, the core activities of the project are being carried out, determining gas permeation properties of the new bio-membranes, screening of the new bio-based polymers, and synthesis of new copolymers from renewable origin. Soon new promising bio-based polymeric asymmetric hollow fiber membranes will be developed. These will be further integrated both in lab-scale membrane modules to be tested at TU/e facilities, and demonstration scale ones to be tested in an industrially relevant environment.

At the same time Environmental performance of these technologies will be evaluated by Quantis, in order to demonstrate not only improved permeation performance and efficiency of the material but also environmental ones for the new bio-based technology.

BioCoMem Project is glad to inform you about the main results achieved so far: the project developing is suffering of some delays due to covid-19 and a plan for boosting activities has been put into practice to recover the activities in the next months.
Hoping pandemic setbacks will be overcame as soon as possible, BioCoMem people recommend you stay safe and enjoy the newsletter reading!



BIOCOMEM project structure of work plan

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Project Objectives

The overarching objective for the BIOCOMEM project is to demonstrate that membrane-based separation techniques using PEBA-type (Polyether block amide) copolymers are more efficient than their heat-based equivalent methods. This will reduce the overall environmental impact through a number of mechanisms. With this, the BIOCOMEM project has three specific objectives.

- First, to produce two new bio-based PEBA co-polymers at pilot scale. Each of these will be specifically designed to add value to three CO_2 separation market sectors: biogas upgrading, natural gas upgrading and post-combustion flue gas treatment.
- Second, to validate – again at pilot scale, in an industrially representative environment – a process for manufacturing three different gas separation hollow-fiber membranes that meet specific performance requirements.
- Third, to provide proof of principle that bio-based membranes can genuinely bring value to the gas separation market.

Partnership

In order to achieve maximum impacts on the European industry, the BioCoMem consortium gathers 8 organisations from 4 countries including top level European Research Institutes, Universities and representative top industries in different sectors (4 SME and 1 IND). The consortium brings together multidisciplinary expertise of catalysts synthesis, membranes development, chemical and process engineering development and construction of turn-key solution in the energy sector including operation and maintenance (i.e. biogas upgrading plants design), modelling and simulation, LCA and industrial risk study.

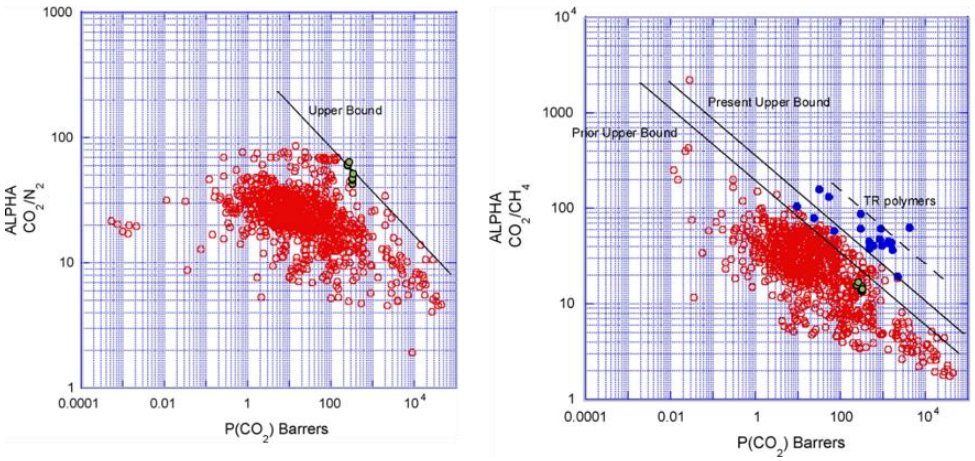
BioCoMem in progress

During the last six months of the project, with respect to the core activities, work has been carried out in the following areas:

- The determination of intrinsic gas permeation properties of the reference bio-PEBAX material.
- Screening of the new developed bio-based polymers for their membrane processability and gas permeation properties.
- Synthesis of new PEO from renewable origin.

Gas permeation properties of the reference Bio-Pebax are plotted (green dots) on CO_2/X Selectivity versus CO_2 Permeability plot that includes data for many membrane polymers (red dots). The black line represents the limit (upper bound) that exists in the gas permeation properties of polymers. What the graph represents, is a trade-off relationship between permeability and selectivity of membranes.

A polymer with a higher permeability has a lower selectivity. It is observed that for the CO_2/N_2 separation (post-combustion processes) the reference bio-PEBAX polymer has remarkable gas permeation properties. Indeed, the experimental data are found on the upper bound (left chart of the figure below).



Reference:
Lloyd M. Robeson, The upper bound revisited, Journal of Membrane Science, 320, 390-400, 2008

The BioCoMem Dissemination Activities and Events

International workshop on CO_2 capture and utilization

16th – 17th of February 2021
Biocomem co-organized the workshop

On the 16th and 17th of February 2021, the Biocomem project participated in the International Workshop on CO_2 Capture and Utilization hosted virtually by Eindhoven University of Technology (TU/e) actively participating in Biocomem.
The workshop was a collaborative effort between several Horizon 2020 projects running in parallel, with the aim of sharing the latest scientific results on CO_2 capture and conversion. The event comes amid a growing consensus in Europe that CO_2 capture from energy intensive industries is crucial for limiting the human activity effects on climate change. In addition, CO_2 is increasingly seen as a raw material that could be used to produce fuels or other commodity products. CO_2 utilization represents a potential valorization pathway for the captured emissions. CO_2 capture can be used to decarbonize heavy industry, such as the iron & steel or the cement production sectors, which supplies essential processed materials

and products to cover society's needs. This knowledge exchange event supports scientists, students, and industrial researchers to continue advancing the latest developments in this exciting field.
The Biocomem Project gave three presentations to share the latest developments:

1. Industrial membrane requirements for CO_2 removal from different gas mixtures – Current practices and developments – *DMT*
2. Turning gas separation membranes green with biobased block copolymers – *Tecnalia*
3. Membrane development steps: from material to final product – *Tecnalia*

World Online Conference on Sustainable Technology

Date: 17th-19th March 2021

Biocomem partners participated at the World Online Conference on Sustainable Technology (WOSCT 2021) held online.
The purpose of WOCST is to provide a forum where representatives from industry, public laboratories, universities, and government agencies can meet, discuss, and present the most recent advances in all fields connected with sustainable technologies. The Conference addressed all aspects, theoretical, experimental and prototype developments of Renewable energy sources, Membrane technology, Hydrogen and fuel cells systems, Power to fuel, Life cycle assessment.

Towards a more sustainable industrial chemistry model in Europe

Date: 18th May 2021

The European chemical industry is facing a new revolution. New concepts such as sustainability and circularity are needed in to overcome current limitations: product and process life cycle linearity, resource constraints, greenhouse gases and pollution, and decarbonization, among others. Biomass and biological feedstocks are projected to play a very important role in the upcoming future since they will replace their fossil-based versions. The program has shown successful initiatives about the development of biobased industries across Europe, and new opportunities to transform the production models according to the new economic and societal needs have been be identified. Opportunities related to the manufacture of high value-added raw materials from renewable sources or

by-products will be presented, by developing fully recycled and recyclable packaging materials, by developing bio-based materials for vehicle manufacturing, and by breaking down barriers to boost the commercialization of bio-based products. In the picture above you can see our project coordinator Oana David, presenting the BioCoMem project at the conference; title of the presentation was "Bio-based copolymers for membrane end products for gas separation". The conference was recorded, and the content can be found here: https://www.youtube.com/watch?v=3PNYLg1URuM

2nd Virtual Biocomem Consortium Meeting

Date 12th May 2021

The main objectives of the meeting were the assessment of the project's achievements (milestones and deliverables) and a plan for the next steps. All the partners give their contribution to this great meeting and your efforts in the last 12 months to bring BIOCOMEM breakthrough bio-based membrane technology forward, despite difficult working conditions due to the pandemic.The meeting has been very intensive, and all the participants collaborate actively providing a friendly atmosphere and strengthening the relationships among the partners filling the gap of being effectively remoted connected.

Upcoming Events

3rd Biocomem Consortium Meeting

Date: November 2021

The main objectives of the meeting will be the assessment of the project's achievements (milestones and deliverables) and a plan for the last year of the project. The partners hope the pandemic emergency will be finally over to meet in persons again. STAY TUNED!
https://www.biocomem.eu/

Euromembrane Conference 2021

Date: 28 November – 2 December 2021

During Euromembrane's 4 days conference, more than 180 lectures and dozens of poster presentations will be presented. The conference will be held in plenary and 4 tracks. The Euromembrane 2021 conference includes all areas of membrane technology to be a meeting for the whole membrane society.
https://euromembrane2021.eu/

Biomembranes for gas permeation

Date: M24 of the project

Several public events and course will be implemented by BIOCOMEM partners and will be offered to interested stakeholders from academia and industry. One of the two public workshops will be on "Biomembranes for gas permeation". It will be organized at TUE (M24), and it will be for a general audience.

BIOCOMEM Website

Visit the BIOCOMEM project at the address – www.biocomem.eu and follow the project on LinkedIn and YouTube.
Let us have your comments!
The next issue of the Newsletter will be released in December 2021

The BIOCOMEM Researchers

Stefan Frehland

Stefan holds a BSc in Earth Sciences and an interdisciplinary MSc in Sustainable Development with a focus on integrated water resources management. In the past years, he has worked on several particulate plastics (micro-, and nanoplastics) related projects in both academia and business. He also gained practical experience in project development in the area of renewable energy and innovation.
Since joining Quantis in 2020, he is working on various projects across different sectors, focusing on solutions related to circularity and ecodesign. He is also involved in multi-stakeholder collaborations such as the PEF initiative of the European Commission.

Anastasia Sliousaregko

Anastasia Sliousaregko is a R&D Process Engineer at DMT Environmental Technology, as from 2020. She has a scientific background in Physics (AUTH, 2017) and a master in Energy Engineering (NTUA, 2020). Her role in DMT involves supporting projects within the product development teams mainly related to membrane applications as well as biomass conversion processes. Main activities include research on membrane systems and modelling thereof, as well as technoeconomical assessment of technologies within the general framework on biomass treatment.

Dr. Ing. Oana Cristina David

Researcher and Project Manager Tecnalia, Spain, Energy and Environment Division, Membrane Technology and Process Intensification Research Group. In September 2007, Dr. Ing. Oana Cristina David graduated as Chemical Engineer from Faculty of Applied Chemistry and Materials Science, Polytechnic University of Bucharest, Romania.
In July 2012 she finished the PhD in Chemical and Process Engineering, Universidad de Cantabria, Spain. Later she performed 2 years and half post-doctoral tanning in RWTH University Aachen, Germany. Now she is an experienced researcher in chemical engineering, particularly in the field of membrane technology.

BIOCOMEM in figures:

- ✓ ***8 partners***
- ✓ ***5 countries***
- ✓ *3.1 M€ project*
- ✓ *Start June 2020*
- ✓ *Duration:* ***36 months***
- ✓ *Key* ***Milestones:***
  - ❖ Development of two new PEBA co-polymers suitable for monolithic hollow fiber membrane production
  - ❖ Optimized recipe for HF membrane production by coating using reference bio-PEBA
  - ❖ Optimized recipe for HF membrane production by spinning using new aromatic/cycloaliphatic polyamide-b-polyether bio co-polymer
  - ❖ Optimized recipe for HF membrane production by spinning using new lignin-g-(polyether-b-polyamide 11) bio co-polymer

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More information on BIOCOMEM available at the project website:
https://www.biocomem.eu/