

The BIOCOMEM summary

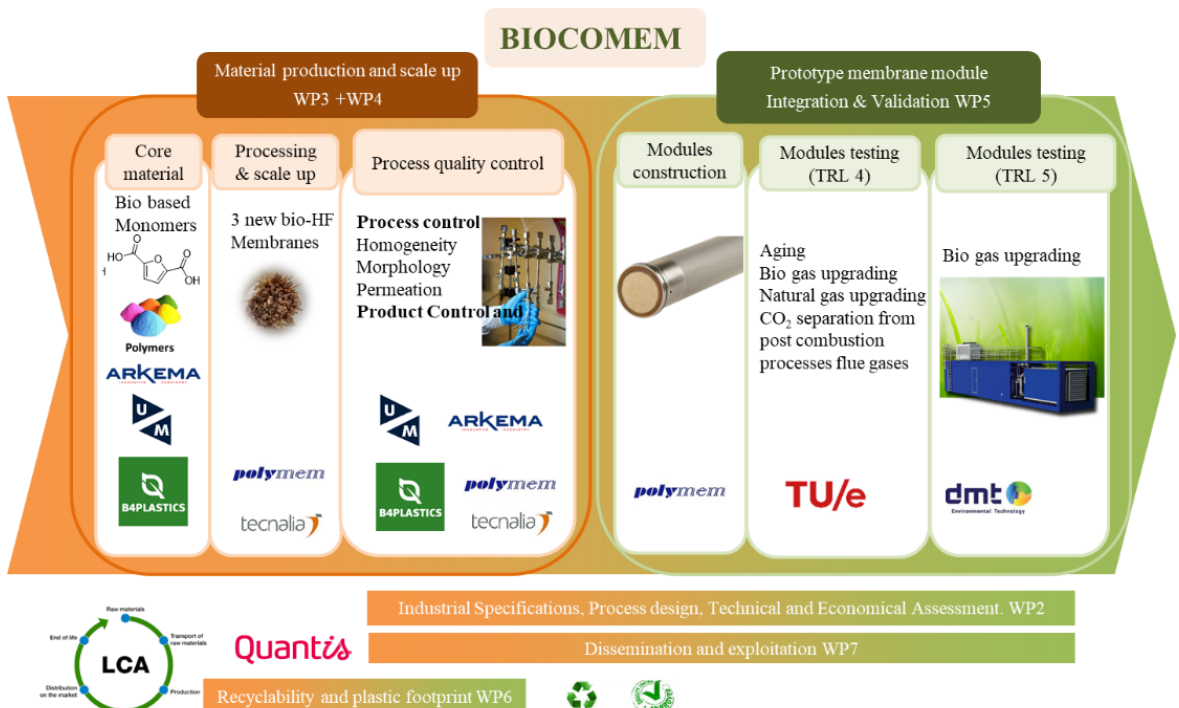
Membrane-based separations offer an alternative to other separation techniques, with the potential for far lower energy consumption.

Using membranes manufactured from bio-based materials, would increase overall sustainability and further reduce the environmental impact.

However, such products need to be able to withstand long-term operation at temperature and pressure variations and prolonged contact with degradative substances. Such membranes require a complex structure that rely on highly specific methods of production. One aspect of this is the use of a hollow fibre.

If these can be made by a spinning technique, it is more energy efficient and less likely to have defects. Current materials for membranes – polyether-block-amide copolymers (PEBAs) – are not ideal for this approach.

The BIOCOMEM project will develop and validate gas separation membranes at TRL 5. These will use bio-based PEBAs that offer higher potential for processing as hollow fibres. The membranes will be specifically designed to improve gas separation performance, offer higher resistance to chemical attack, all while using an increased amount of bio-based material.



The BIOCOMEM Partners



www.tecnaia.com

TECNALIA RESEARCH & INNOVATION is a private, independent, non-profit applied research centre of international excellence. Legally a Foundation, TECNALIA is the leading private and independent research and technology organisation in Spain and one of the largest in Europe, employing more than 1,400 people (248 PhDs) and with an income of 110 Million € in 2018.

The whole team at TECNALIA has one GOAL: to transform technology into GDP, meaning wealth to improve people's quality of life through generation of business opportunities for industry. TECNALIA is committed to generate major impacts in economic terms, by means of innovation and technological development, addressed by 6 business divisions covering the economic sectors of Energy, Environment, Industry, Transport, Construction, Health and ICT. TECNALIA has been granted over 658 patents and promoted more than 20 spin-off companies.



Maastricht University

<https://www.maastrichtuniversity.nl>

Maastricht University (MU) hosts about 16,000 students in international BA, MA and graduate programs and 2,000 academics. In the 2014 QS ranking of young research universities MU, ranks 4th as best young university in Europe. MU has since 2012 a research institute specifically dedicated to "Biobased Materials", the Aachen-Maastricht Institute for Biobased Materials (AMIBM). MU also hosts the first international Master program on Biobased Materials in Europe. MU was partner in the EU FP7 with over 700 projects, while coordinated more than 150 projects. MU has been awarded the European Commission's "HR Excellence in Research" logo in 2015.



www.tue.nl

Eindhoven University of Technology (TU/e) is a research university specializing in engineering science & technology. Our education, research and knowledge valorization contribute to: science for society:

- solving the major societal issues and boosting prosperity and welfare by focusing on the Strategic Areas of Energy, Health and Smart Mobility
- science for industry: the development of technological innovation in cooperation with industry
- science for science: progress in engineering sciences through excellence in key research cores and innovation in education

B4PLASTICS is a Belgian scale-up tech company designing, developing and distributing eco-plastic products. Tomorrow's sustainable world will increasingly require the use of local, renewable and/or biodegradable resources, and that is exactly what the company starts already today. This way, B4plastics products guarantee a pioneering novel balance between price, quality, functionality and sustainability.

POLYMEM SA started its business in 1997, specializing in the development and manufacturing of membranes based upon hollow fibres. POLYMEM develops and manufactures also equipment based upon membrane filtration. POLYMEM sells its products to the most important actors on the water and wastewater markets: Veolia, Ondeo, Saur, and smaller national and international SMEs. Polymem modules family has obtained in 2005 the NSF/ANSI61 certificate. At the present time 2017, 60 people are employed by POLYMEM, achieving a turnover around 4 million of Euros. Between 6 and 8 peoples are employed at full time in the R&D department of the company.

Quantis is a leading sustainability and life cycle assessment (LCA) Swiss consultancy, specialised in supporting organisations to measure, understand, manage and communicate on the sustainability performance of their products, services and operations.

With LCA as its backbone, Quantis purpose is to guide organisations to define, shape and implement smart solutions from an environmental sustainability perspective, by delivering robust metrics, resilient strategies, useful tools and credible communications. Amongst Quantis sustainability consultants, several are internationally renowned experts in LCA, shaping the future of sustainability, backed by a strong scientific background.

Arkema is a French chemical company with a turnover of 8.8 B€ and 20000 employees worldwide. The company is a global supplier of chemical specialties. High performance material sales generates 46% of its turnover. Moreover, Arkema is a global leader in high performance bio-based polyamides. Its R&D facilities are mainly located in France.

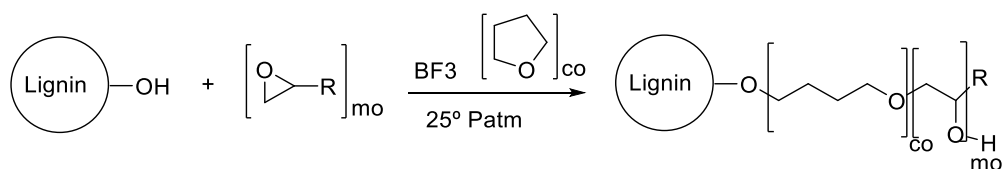
Arkema has an expertise in designing polymers for technical applications. Modifying polymer compositions using a tool box of monomers, but also by graft polymerization, in order to satisfy technical requirements of new applications, is the daily work of the company's R&D staff.

DMT Environmental Technology was founded in 1987 and has grown into a company with around 80 employees worldwide. Working from six branches and sales offices around the world. The head office is in Joure, sales offices are located in Montreal in Canada, in Oregon America and also an office in Kuala Lumpur in Malaysia. DMT Environmental Technology is a company that specializes in engineering and delivering turn-key installations that help companies to contribute to the environment in a sustainable and profitable way. One of the major product lines DMT Environmental Technology offers, enables biogas to be upgraded to pure methane for gas grid injection. Their main product within this product line is the Carborex-MS, a system for CO₂ separation using semi-permeable membranes. Within the field of membrane-based biogas upgrading DMT is one of the leading companies.

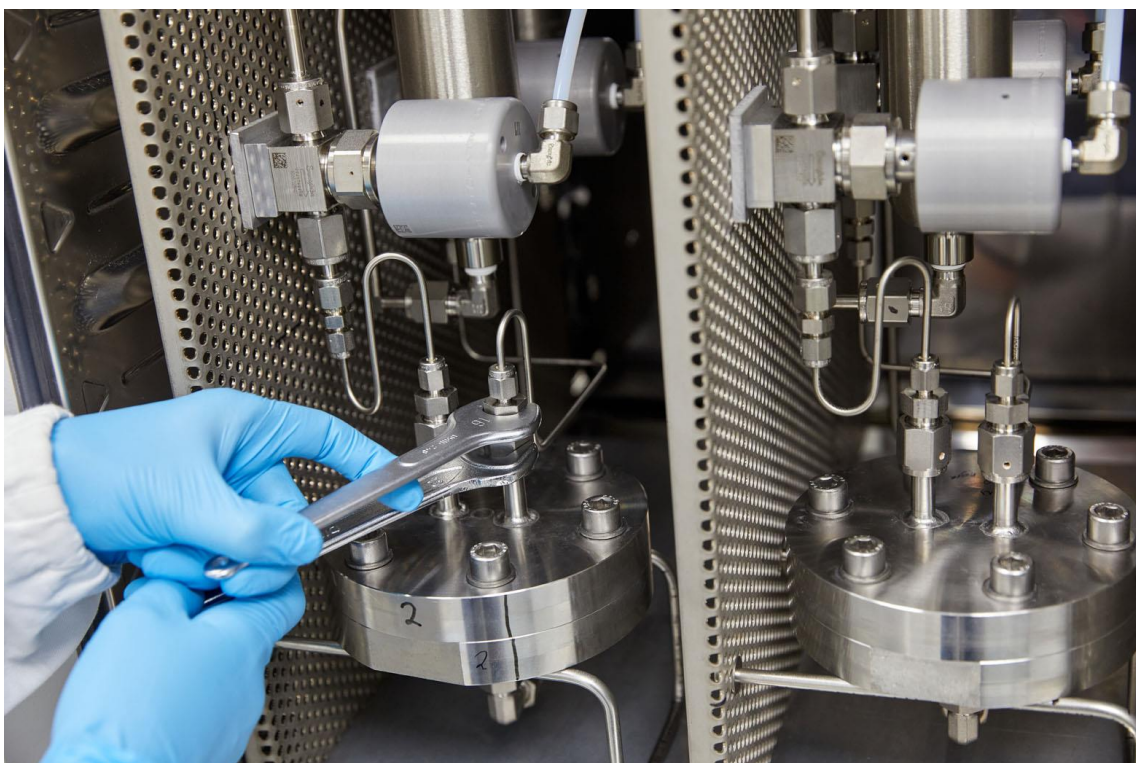
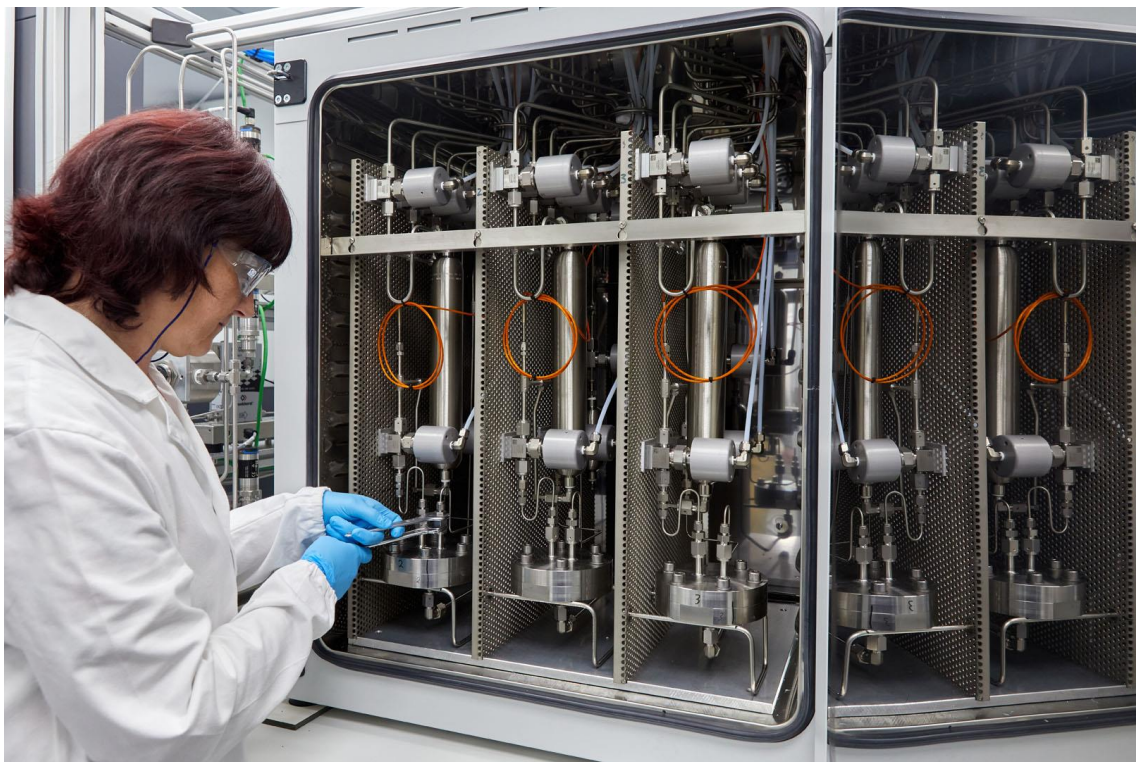
The BIOCOMEM Highlights

First membranes tested

One of the goals of the project is to increase the biobased content of the PEBA. Another goal is to improve the mechanical, thermal and permeation properties of the polymer. Regarding the polyether block, both objectives are addressed by using lignin-derived polyether polyols. In the first six months of the project three polyethers with different composition were synthesized as depicted in picture. These new lignin-derived polyether polyols meet the requirements to be a good replacement for the fossil-based polyether counterpart.

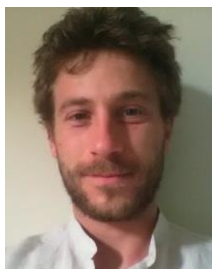


Membrane development: The screening for gas separation of first bio-based PEBA materials has started using dense flat sheet films.



The gas permeation system used to test gas permeation in flat sheet films at TecNALIA (based on constant volume technique)

The BIOCOMEM Researchers



My name is Andrea Randon, I am 31 years old and I studied Energy Engineering at the University of Padua, Italy. I did my Master thesis in Delft (NL) based on the activities carried out during my internship for a company which works in the field of water treatment solutions; the topic was related to management of concentrated brine by means of evaporators. I've worked in European Projects for ICI Caldaie Spa (ICILab) in the field of hydrogen production. I'm now (September 2020) starting my PhD with the TU/e, which will be strongly related to the BioCoMem project.

Dr. Katrien Bernaerts

Maastricht University

Associate Professor Biobased Materials, Polymer Chemistry

Responsibilities: Supervision of research projects, funding acquisition, teaching, general management of a group consisting of 8 PhD's, 2 post-doc, 1 technician and some bachelor/master students.

Experience and background: Research chemist macromolecular chemistry with a broad experience in both academia (PhD in polymer chemistry from Ghent University, Belgium) and industry (Agfa, Teijin Aramid, DSM). My main research focus is on the design of polymer materials with tunable properties and recyclability exploiting the functionality of biobased building blocks. Structure-property relationships of the obtained polymers are studied in several fields of application e.g. stimuli-responsive polymers, coatings, fibres, organic membranes, engineering plastics and biomedical materials. Growing focus on the use of artificial intelligence techniques to support the experimental work, e.g. data interpretation and prediction of structure-property relationships.



I am Miren Etxeberria Benavides: Since 2008 - Researcher Tecnalia, Spain, Energy and Environment Division Membrane Technology and Process Intensification group. Degree in Chemistry in 2008 at the University of the Basque Country (UPV-EHU). In 2013 I obtained a Master degree in Applied Chemistry and Polymeric Materials at the same university. My work is focused on polymeric and mixed matrix membranes for gas separation. I have experience in polymer synthesis and flat and hollow fiber membrane preparation by phase inversion technique. I participated/am participating in several Spanish (AIRSEP, PROSAVE2) and European projects (M4CO2, MEMBER).

The BIOCOMEM Events

BIOCOMEM is co-organizing the International workshop on CO₂ capture and utilization

Tuesday February 16, 2021 to Wednesday February 17, 2021



Registrations at <https://iwccu.org/index.php>

BIOCOMEM Key figures

Project start: 1st of June 2020

Project end: 31 May 2023

Funding scheme: H2020-EU.2.1.4, H2020-EU.3.2.6

Overall Budget: 3.104.512,50 €

EU contribution: 2.353.438 €

Grant agreement Nr: 887075

Coordinator: FUNDACION TECNALIA RESEARCH & INNOVATION (Spain)

Project coordinator: Oana David