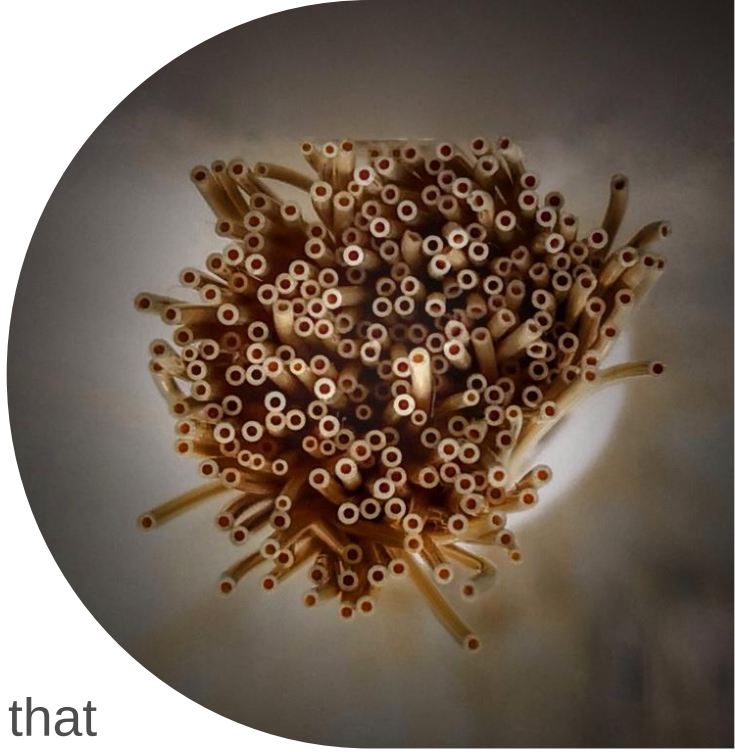
Bio-based copolymers for membrane end products for gas separations



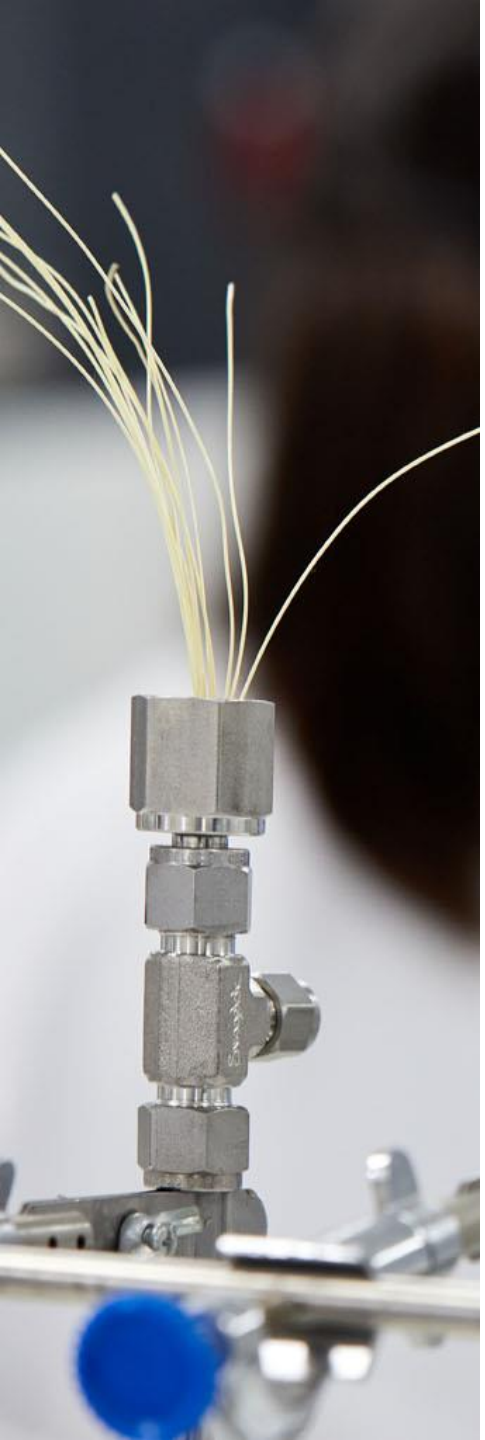
BBI JU contribution: €2.35 million

Duration: June 2020 – May 2023

Feedstock: agricultural, biowaste

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 reduces the overall environmental impact of separation technology on three different levels:

- Application: direct CO_2 capture
- Use of membrane technology with a higher efficiency and lower energy use than other separation options
- The development of membranes based on bio-based precursors for membrane preparation



Bio-based copolymers for membrane end products for gas separations

Project lead: Tecnalia (Spain)

BBI JU contribution: € 2 353 438

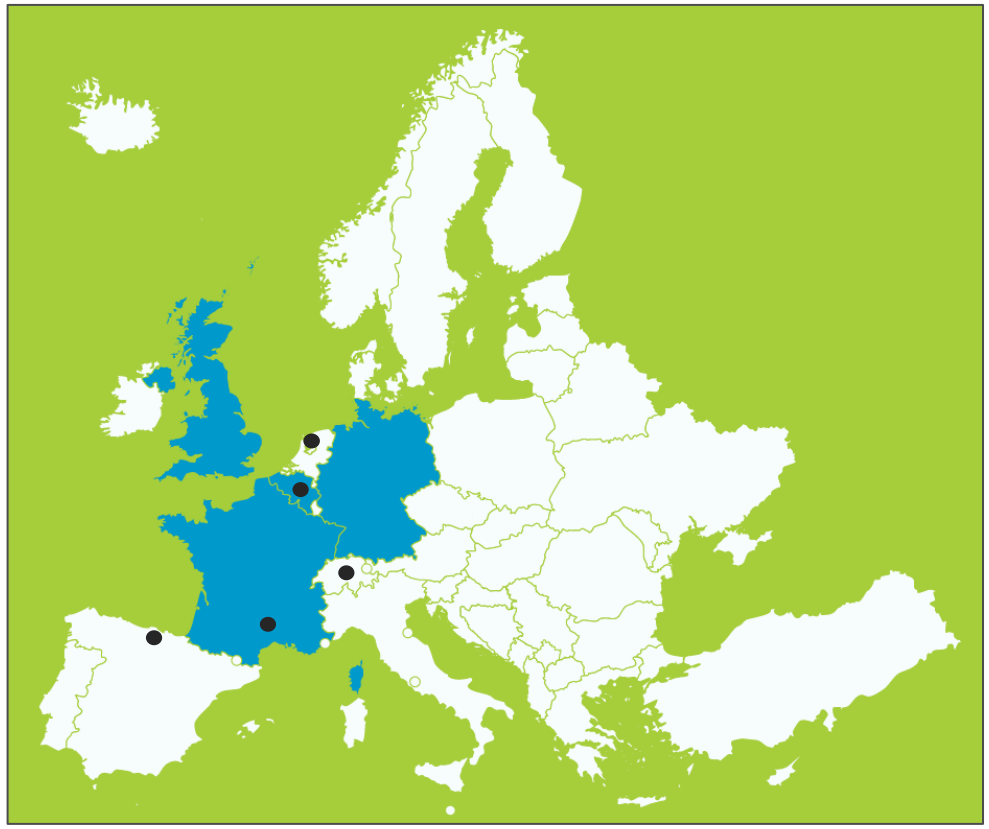
Duration: 01.06.2021 – 31.05.2023

2 HES

2 RTOs

2 SMEs

1 Large Company



tecnalia
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

Maastricht University

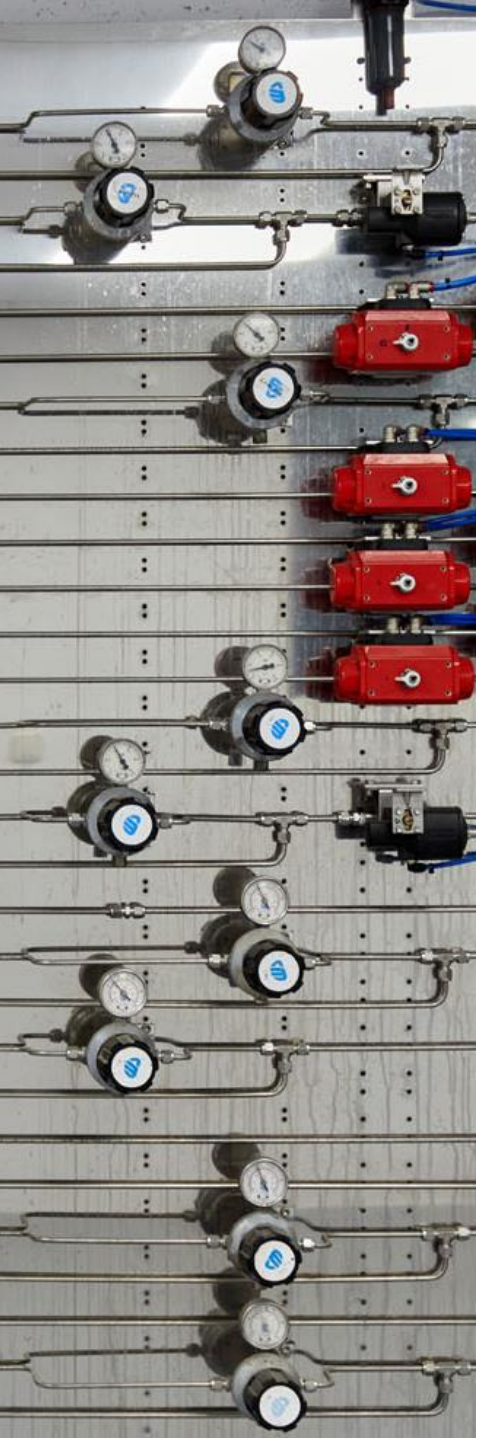
TU/e

B4PLASTICS

Quantis

Helmholtz-Zentrum hereon

ARKEMA



Context and Objectives

- **Context/main challenge**

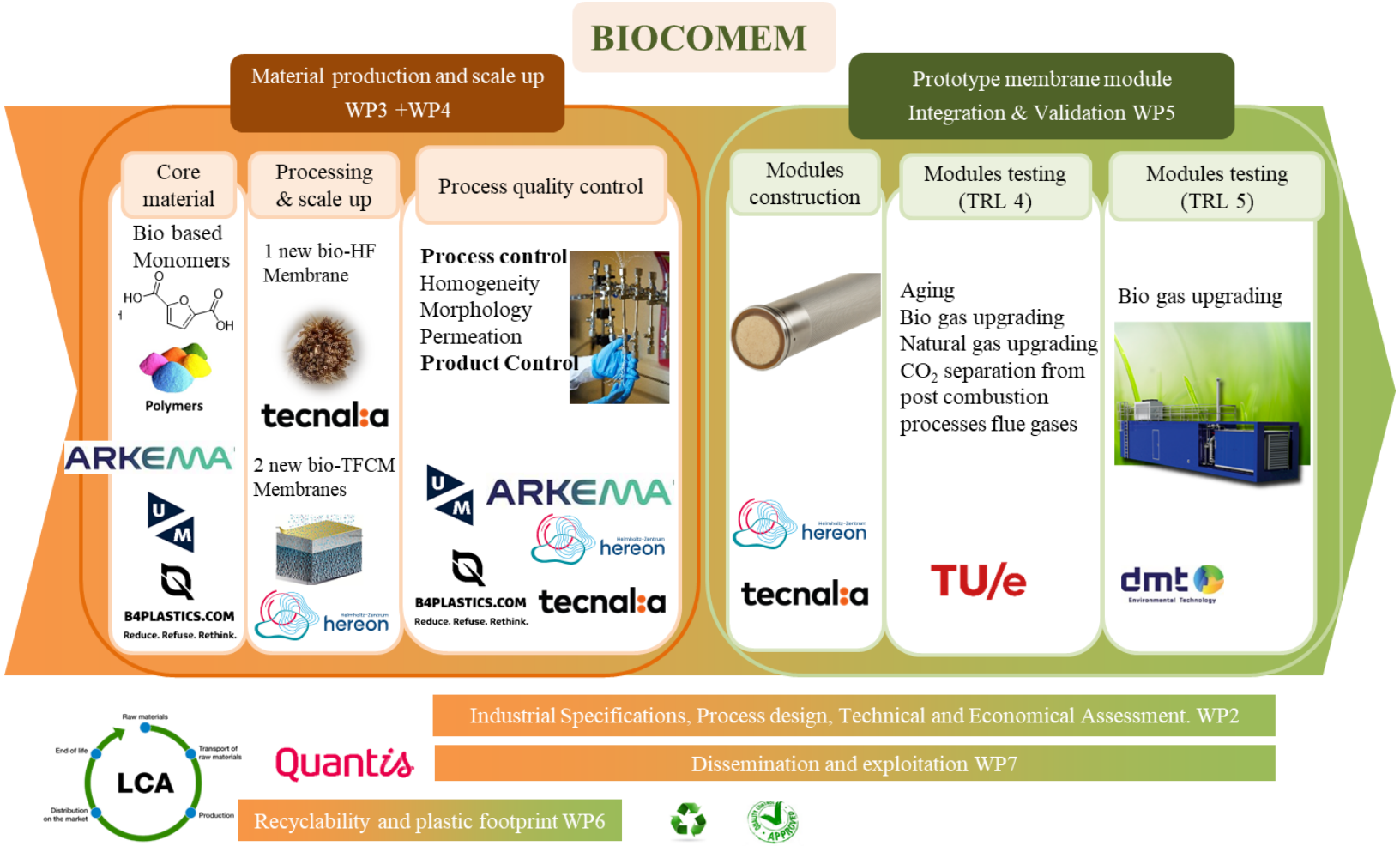
  Increase the application of membrane-based separation technology in order to:

  - decrease the energy consumption
  - increase the overall sustainability
  - reduce the environmental impact

  of separation processes in the chemical industry.

- **Objectives:** develop bio-based gas separation membranes using polyether-block-amide copolymer type (PEBAs) chemistry with improved functionality for:
  - higher processability into monolithic hollow fiber membrane
  - higher gas separation performance
  - higher resistance to chemical attack (aging)

BIOCOMEM value chain and main activities



Work that has been carried out

Material Production and scale up:

- Core material:
  - 5 new Bio-PEBA co-polymers have been developed at lab scale.
  - One fatty acid derived Bio-PEBA co-polymer is being develop at pilot scale.

Processing and scale up:

- Bio-membrane development at lab scale: all 5 new Bio-PEBA have been characterised for gas permeation
- Bio-membrane up-scaling activities:
  - the selected fatty acid derived Bio-PEBA is currently processed into monolithic hollow fiber membrane (Prototype B)
  - The reference Bio-PEBA is processed into thin film composite hollow fiber membrane by dip coating (Prototype A)

Benefits to society and the environment

Use of biomass instead of fossil fuels as feedstock is expected to result in a reduction of GHG emissions (to be confirmed by the Life Cycle Assessment along the project).

BIOCOMEM project specifically works also on recyclability of material and on use of nontoxic and bio-based solvents, so that the large-scale production of membranes can be made more environmentally friendly.

BIOCOMEM technologies are more energy efficient than state of the art technologies (PSA, cryogenic distillation, ..)

BIOCOMEM products contribute directly to CO_2 capture from technical processes.

Local impacts

key partners

- key components suppliers
- RTOs and Universities
- system manufacturer (total or partial)
- system/technology integrators
- Public administrations
- finantial entities

key activities

- R&I, O&M, design, engineering and commercial capacities
- fast response vs. failure

key resources

- Process Design
- Detailed Engineering
- Key components:
  - *Feedstock*
  - *Monomers*
  - *Polymers*
  - *Membranes*

value propositions

- Fabrication, sales and/or O&M of CO_2 separation systems based on:
  - Membrane separation system for refrigerant gas mixtures separation
  - Membrane separation system for post combustion flue gas treatment
- "Pay per use" based on refrigerant production or CO_2 capture

customer relationship

- Operation and Manteinance (continuous follow-up)
- customer attention
- personalized services

exploitation channels

- commercial network
- public contests

customer segments

- Large CO_2 emitters:
  - *Cement plants (lime and dolomite sector included)*
  - *Power plants*
  - *Refineries*
  - *Steel Industry*
- Refrigerant consumers:
  - *Food and healthcare*
  - *Consumer electronics industry*
  - *Households*
  - *Automotive Industry*
- CO_2 consumers:
  - *EOR*
  - *Beverage Carbonation*
  - *Food packaging*
  - *Urea production*
  - *Methanol production*

cost structure

- components
- manufacturing costs
- O&M resources
- design costs
- commercial cost
- certifications
- financial costs

revenue streams

- Refrigerant sales
- CO_2 sales
- O&M services
- systems commercialization
- licensing and engineering services

Fabrication and/or O&M of separation systems | Product direct sales or self consuption | Both Business Models