# *View of Bio-based Plastics Research and its European Funding from a Networking Perspective*

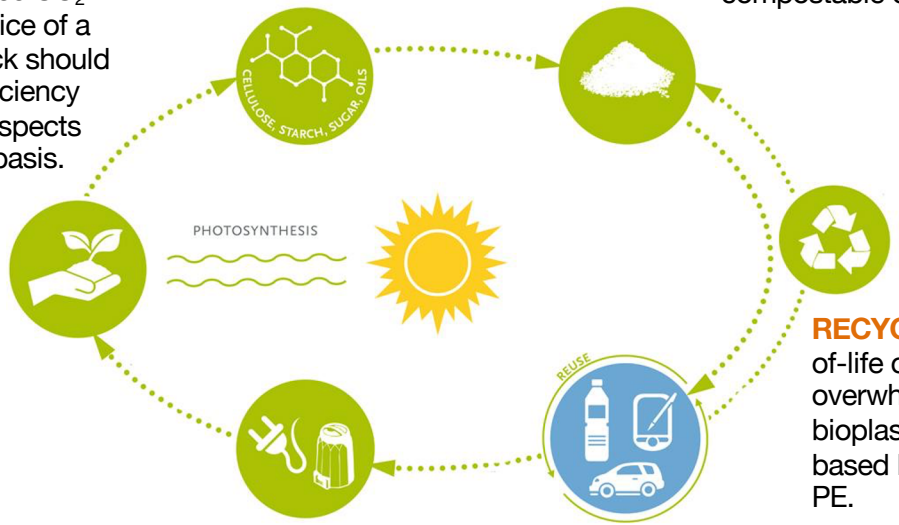
**Christian Schulz, EU Project Manager, European Bioplastics (EUBP)**

European Bioplastics Research Network Event: Past and Current H2020 Projects Joined in Bioplastics Research | 24.06.2020 | Online

# *Bioplastics life cycle model – closing the carbon loop*

**RENEWABLE RESOURCES** increase efficiency and reduce $CO_2$ emissions. The choice of a renewable feedstock should be governed by efficiency and sustainability aspects on a case by case basis.

**BIOPLASTICS** are a large family of materials that are bio-based, compostable or both.




**RECYCLING** is the end-of-life option for the overwhelming part of bioplastics, e.g. bio-based PET or bio-based PE.

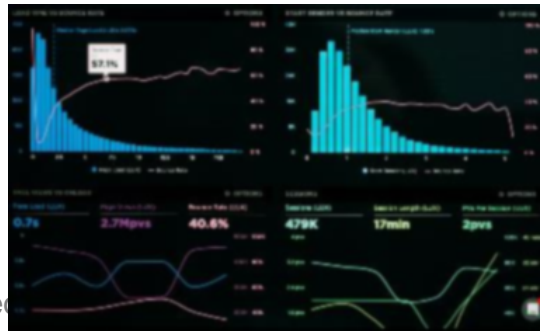
**ENERGY RECOVERY / ORGANIC RECYCLING** are additional options for bioplastic materials where fitting the product and the existing waste management infrastructure.

**PRODUCTS:** bioplastics can be used in all applications where fossil-based plastics are used.

# *Overview on bioplastics research funding on a European level*

- European Bioplastics monitors relevant projects concerning biobased and biodegradable plastics, its material development, recycling, promotion etc.
- Monitoring contains data of different EU funding (such as H2020/BBI-JU, LIFE…) for **more than 130 projects** with direct link to the area of bio-based/biodegradable plastics are or have been performed between 2007 and 2020.

- Average project funding: **~ 6,950,000 €**
- Average funding rate: **~ 85.2 %**
- **Total: ~ 903,980,000 €**
- **Annual funding: ~ 69,540,000 € / a**



Data may not cover every project ever funded, but gives an educate

# *Creating and securing jobs in Europe*

- Currently, around 23,000 people are employed in the bioplastics sector in Europe.
- With the right legislative framework and the expected market growth, this number could grow to:
- **300,000 high-skilled jobs across Europe by 2030**;
- Most of them in rural areas, promoting re-industrialisation and creating new income streams for farmers.

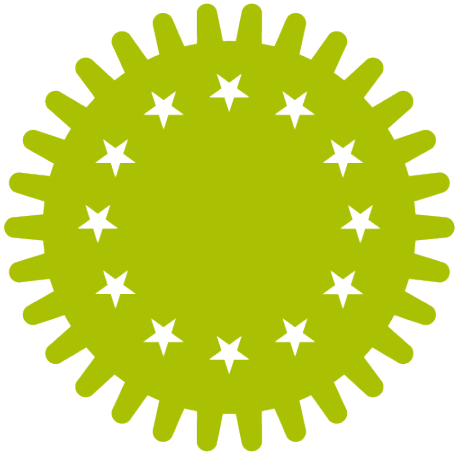
Source: EuropaBio, 2016

# *Bioplastics are a crucial pillar of the bioeconomy in the EU*

- Growing market with high value creation
- Creation of new jobs
- Strengthening of rural development – investing in biorefineries
- High acceptance at consumer level
- Contribution to climate protection and GHG emissions reduction targets
- Reduction of dependency on oil
- Biodegradability and compostability present new options for recycling
- EU's bioeconomy sectors:
  - > € 2 trillion in annual turnover
  - > 22 million jobs (9%) of the workforce.

# *The need for a more favourable legislative framework*

- In order for bioplastics to **unfold their full environmental and socio-economic potential** in Europe, we would **need a more favourable legislative framework** in place.
- European Commission's '**Circular Economy Action Plan**' links the **bioeconomy** and the circular economy with the aim to treat waste as valuable resource and make Europe's economy cleaner and more competitive.
- The Commission's Roadmap to a **Strategy on Plastics** has given priority to assess how to decarbonize the plastics industry and to increase the efficiency of plastic recycling and waste management systems.
- **This implies to also better align legislative frameworks to research funding on a European level.**



# *Relevant EU policy frameworks and developments*

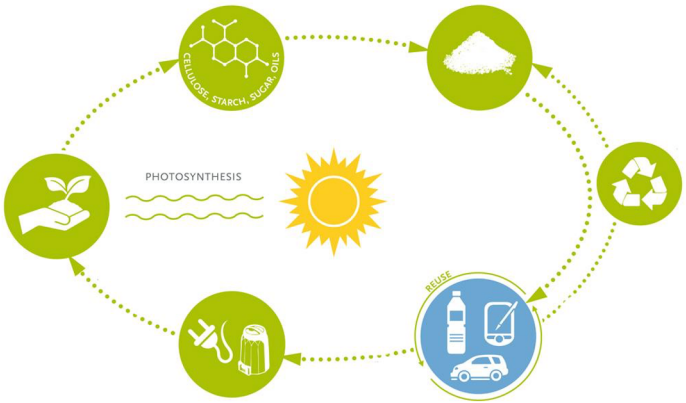
- **EU Circular Economy Package**
  - Transition from linear to circular economy model
- **Strategy on Plastics**
  - Lower fossil carbon dependence of plastics economy
- **Packaging and Packaging Waste Directive**
- **Waste Framework Directive**
  - Encourage bio-based and recycled packaging
  - Separate biowaste collection
  - Include organic recycling in definition of recycling
- **Fertilisers Regulation**
- **EU Bioeconomy Strategy**

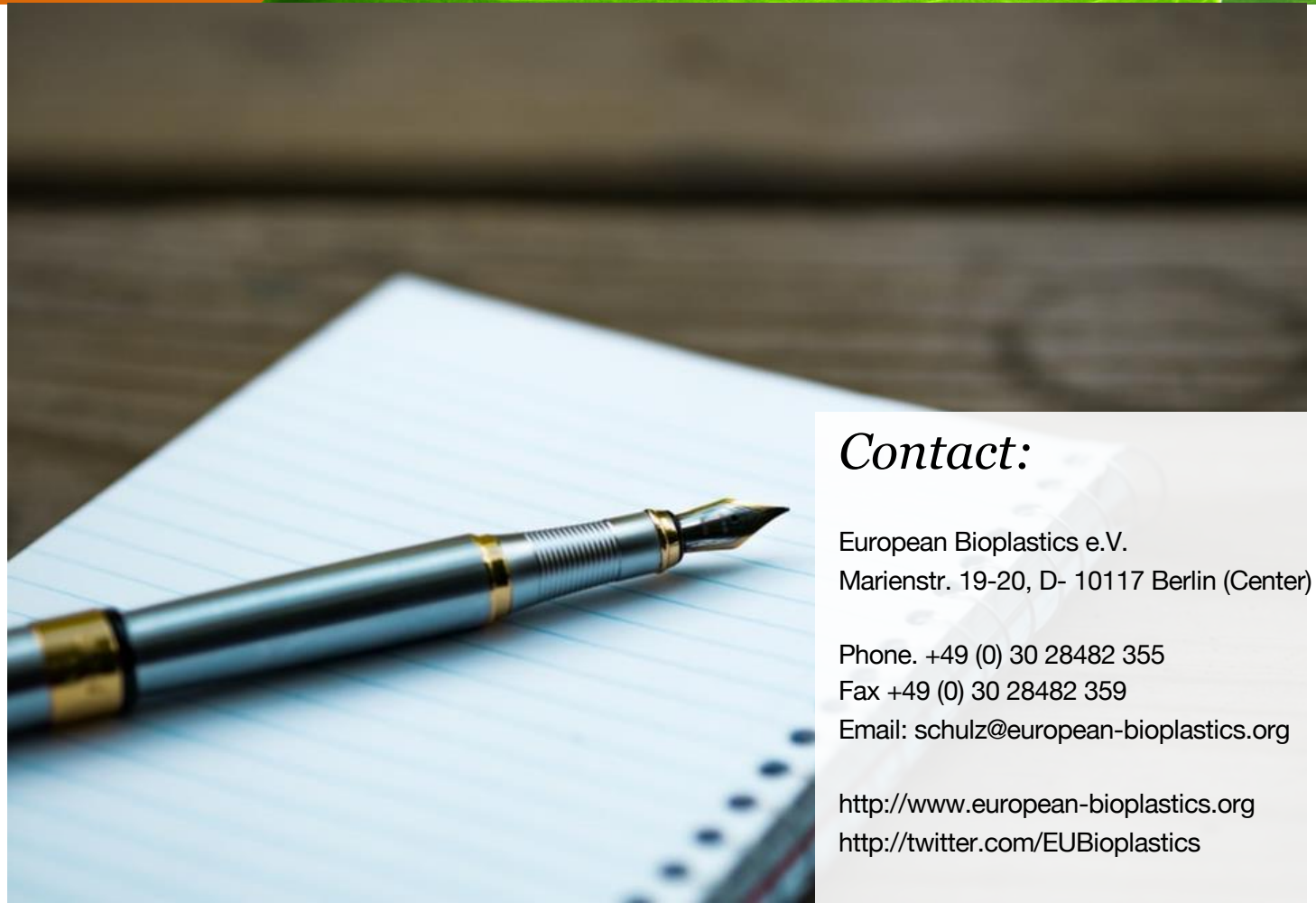
# *Bioplastics essential in a ‚new plastics economy'*

- Links the bioeconomy and the circular economy
- Treat waste as a valuable resource
- Cut resource use, reduce waste, enable true circularity by setting clear methodologies and standards
- Addresses all stages of the product life cycle, including product design (efficient use of feedstock) and waste treatment
- Feedstock from renewable sources helps to decouple plastics production from fossil feedstock and reduce greenhouse gas emissions
- Compostable plastics can help return nutrients to the soil
- Increase use of secondary raw materials; enable separate waste collection and improved waste treatment options; reduce and eventually phase-out landfilling for recyclable materials

# *Take away messages*

- Bioplastics play an **important role in a European Circular Bioeconomy** to help closing the carbon loop and lower fossil dependence of plastics industry,
- but a **better alignment of research funding and the legislation**,
- as well as a more **consistent exchange between funded projects** of past and present **on European level and national level** is needed.





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# Policy Research and Bio-based Plastics at the Institute European Environmental Policy (IEEP)

Dr Andrew Farmer

24 June 2020
EUROPEAN BIOPLASTICS RESEARCH NETWORK EVENT 24 June 2020

Institute for European Environmental Policy

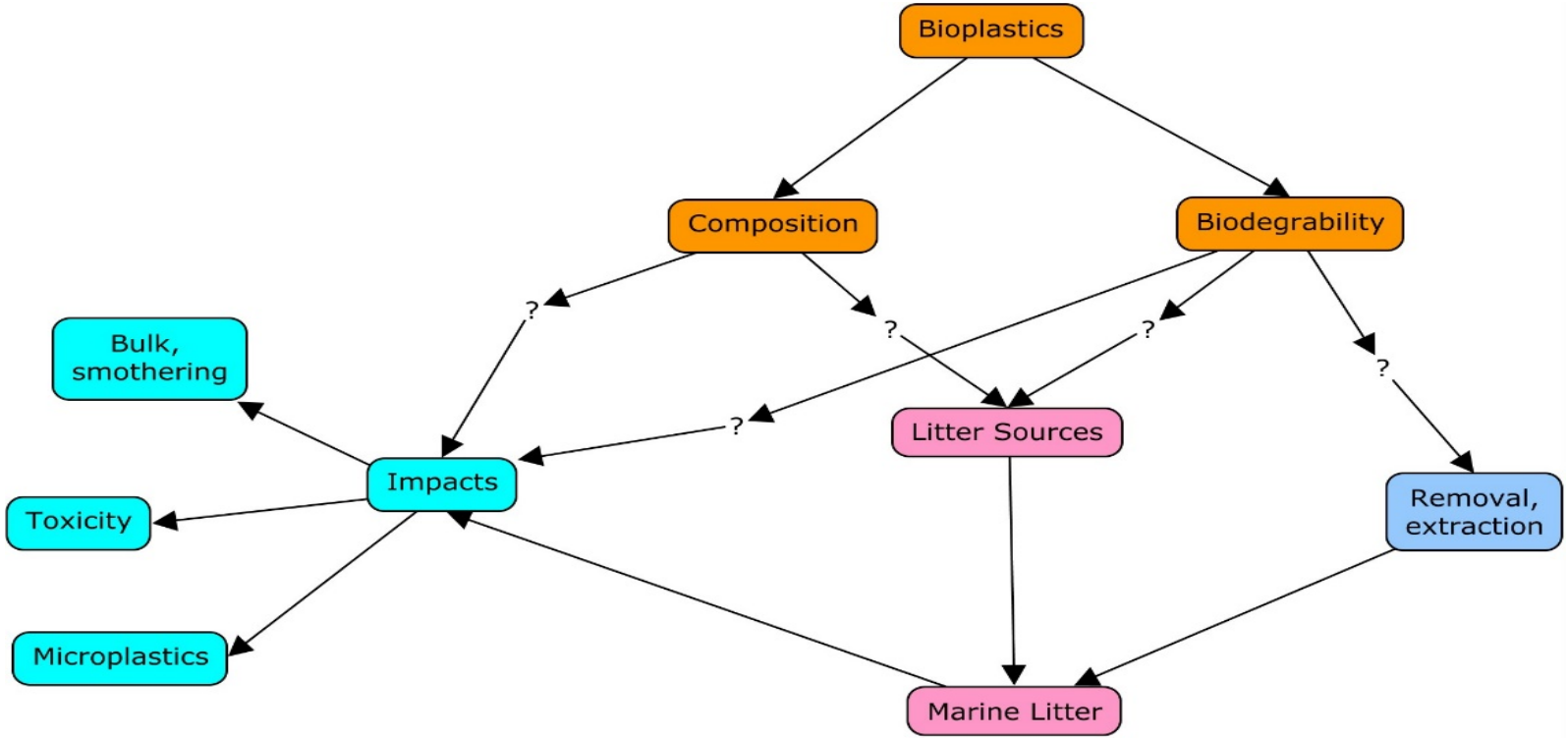
# Introduction

- IEEP is leading the policy analysis work within SEALIVE H2020 project (2019-2023) – more about this project later
- Presentation draws on this work and other relevant IEEP work.
- Policy analysis on BPs should begin with fundamental questions:
- What problems are they trying to solve? Do they achieve this?
  - Plastics – littering, longevity in env, microplastics, recyclability
- Are they the best solution (short, medium, long term)?
  - Other alternatives, other ways to deliver product/service
- Does production, use, discard and/or management of BPs solve or create problems?
- Then can examine the interaction with EU policies relevant to these, including wider interactions, e.g. within the bioeconomy. What do we want BPs to do (and not do) and, therefore, what policies control, support, enable this?

# Policies and Bio-based plastics (BPs)

- New CEAP states EC to develop a “policy framework” for bio-based plastics (sourcing, labelling; use of biodegradable or compostable plastics).
- Policy is more than law/regulation, e.g. public awareness on plastics – how do BPs affect these policies?
- Regulatory policies: production, manufacture, products, waste management (EIA, WFD, IED, Ecodesign, Food Safety, etc.)
- Market interventions: env taxation (MS level)
- Information: labelling
- Management interventions: MSFD
- Enabling (or not): e.g. wider bioeconomy and the CAP
- Wider issues: internal market, trade policy, etc.
- Analysing these against objectives – but also the limitations of those policies to deliver
- Across all: what diversity is there within BPs and how does this affect achieving objectives and the individual policies?

# Analysis by problem, e.g. marine litter



# Importance of practical implementation

- Critically important!
- What if policies are incompletely applied?
  - If waste policy required separation of BP products, what would failure mean, e.g. to plastics recycling?
- Are there likely to be compliance problems and, if so, how to address these?
- Do policies reflect consumer behaviour and diversity across EU?
- How much complexity can consumers absorb?
  - Avoid SUP bottles
  - Recycle SUP bottles
  - Treat BP bottles differently

# Conclusion

- Policy work within SEALIVE is at early stage
- Building on wider policy analysis on individual environmental and other EU and MS policies
- Keen to discuss with others exploring any or all policies relevant to BPs
- Do get in contact!
- More about SEALIVE from Miriam later

Institute for European Environmental Policy

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SEALIVE

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# BIO4SELF: High performance biobased self-reinforced composites from polylactid acid

*Current and Past H2020 Projects Joined in Bioplastics Research*

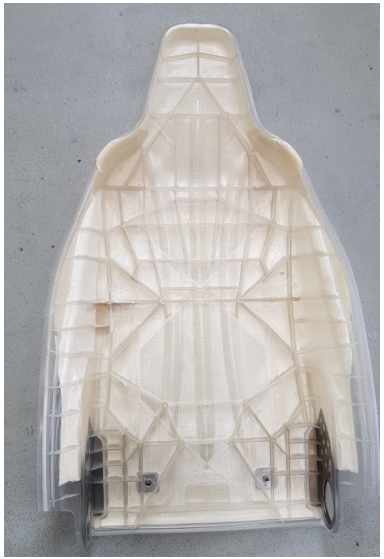
*June 24, 2020 Online*

Guy Buyle

Co-funded by the European Union

# JEC Innovation Award for ‘Sustainability’

## Thermoformed seat shell structure from selfreinforced PLA



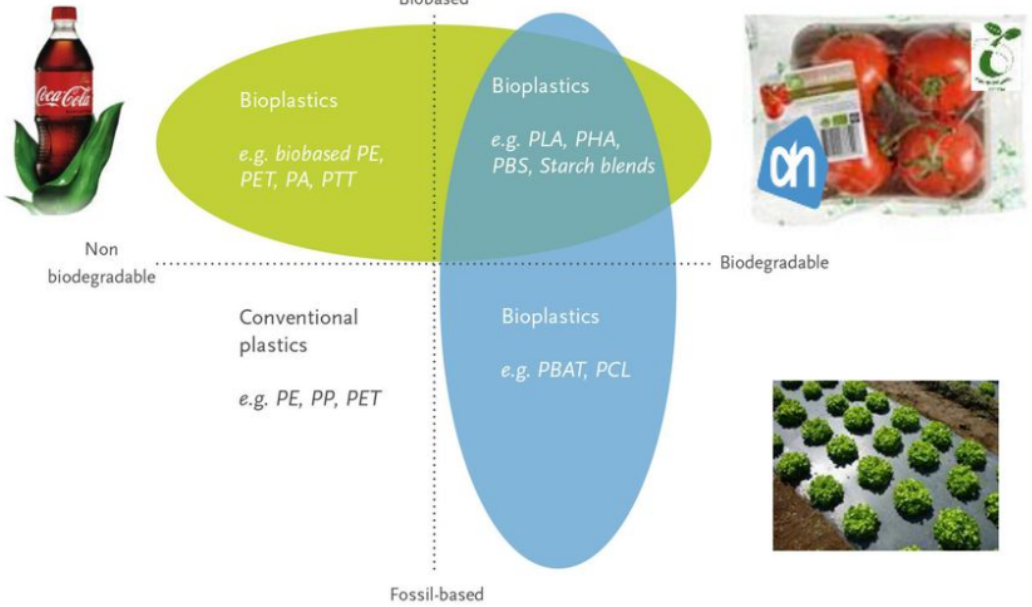
Acknowledgement to MoPaHyb project for use of the mold for the seat structure

# Outline

- Why PLA ?
- Why selfreinforced ?
- BIO4SELF approach ?
- Key results
- Further info

# Why PLA ?

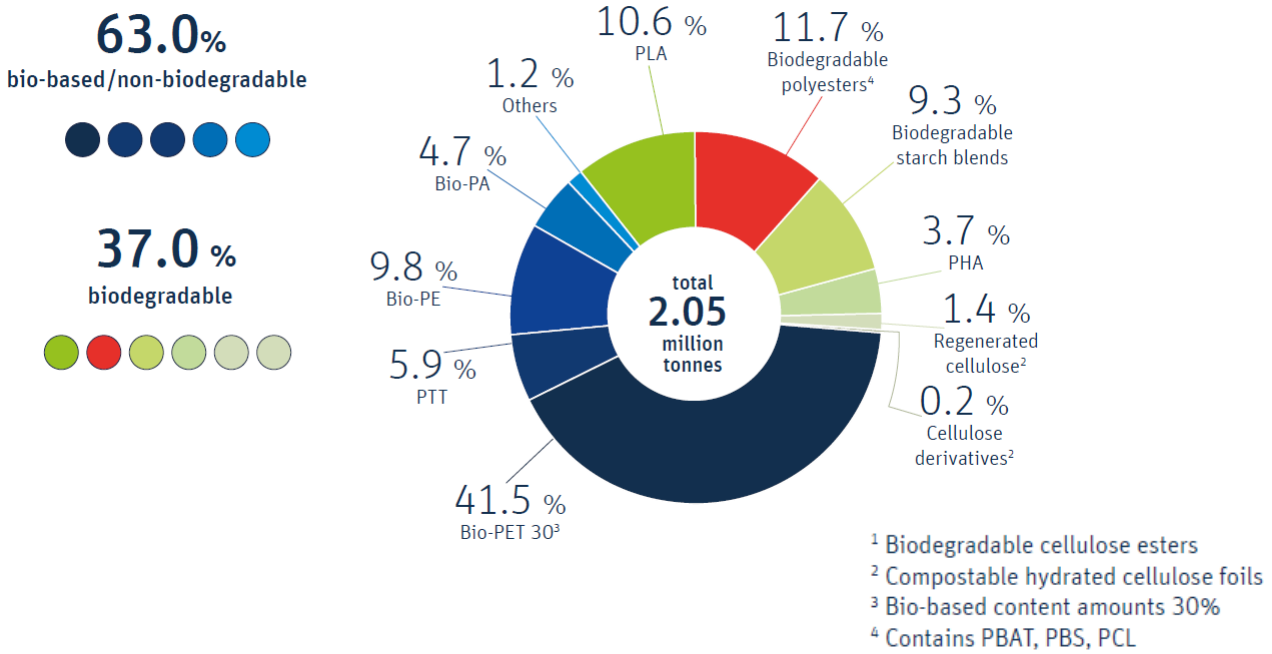
# Some terminology:
## A bioplastic is biobased and/or biodegradable




- A bioplastic can be fossil based
- A bioplastic can be NOT biodegradable

Source: European Bioplastics

# PLA is one of most used biobased biodegradable bioplastics

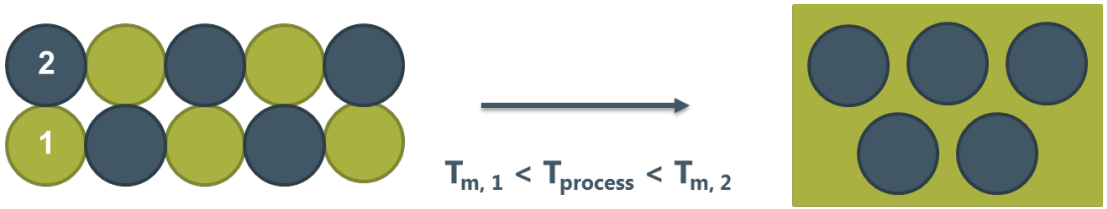



Source: 'Biopolymers facts and statistics', IfBB (2017)

# Why selfreinforced ?

# SRPC: selfreinforced polymer composite

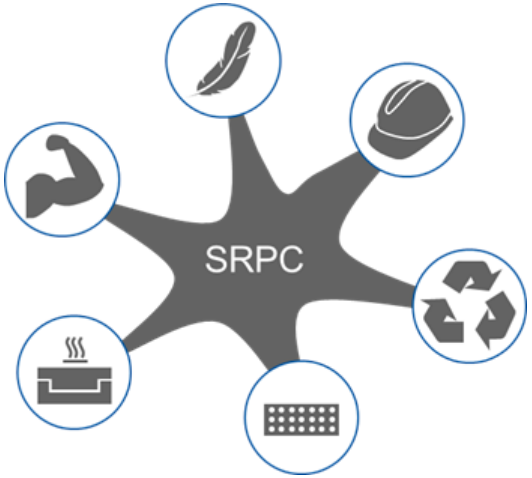
SRPCs consist of polymeric reinforcing fibres embedded in a matrix of the same polymer type




- Production of these composites via combination of:
  - 1 a low melting PLA grade
  - 2 a **high stiffness, high melting PLA reinforcing fibre**

# SRPCs offer a wide range of advantages

- Lightweight: high specific stiffness and strength
- High impact resistance
- Excellent fibre-matrix adhesion
- Inherent thermoformability
- Environmentally benign material due to high recyclability of mono material composite




→ **Applications**: automotive, protective gear,…

# BIO4SELF approach ?

# Methodology:
# from raw material to composites

- Compounds
  - Hydrolysis stabilised compounds
- Fibre materials
  - High stiffness reinforcement yarns
  - Low melting matrix yarns
- Textile intermediates
  - Hybrid yarns via comingling
- Composite manufacturing & Prototyping
  - Filament winding
  - Press consolidation
- Environmental & EoL aspects

**By who ?**

# Multidisciplinary consortium


16 partners from within Europe:
5 SMEs, 5 large enterprises, 3 research centres, 3 univs

→ **BIO4SELF covers the whole value chain**

# BIO4SELF - Acknowledgement

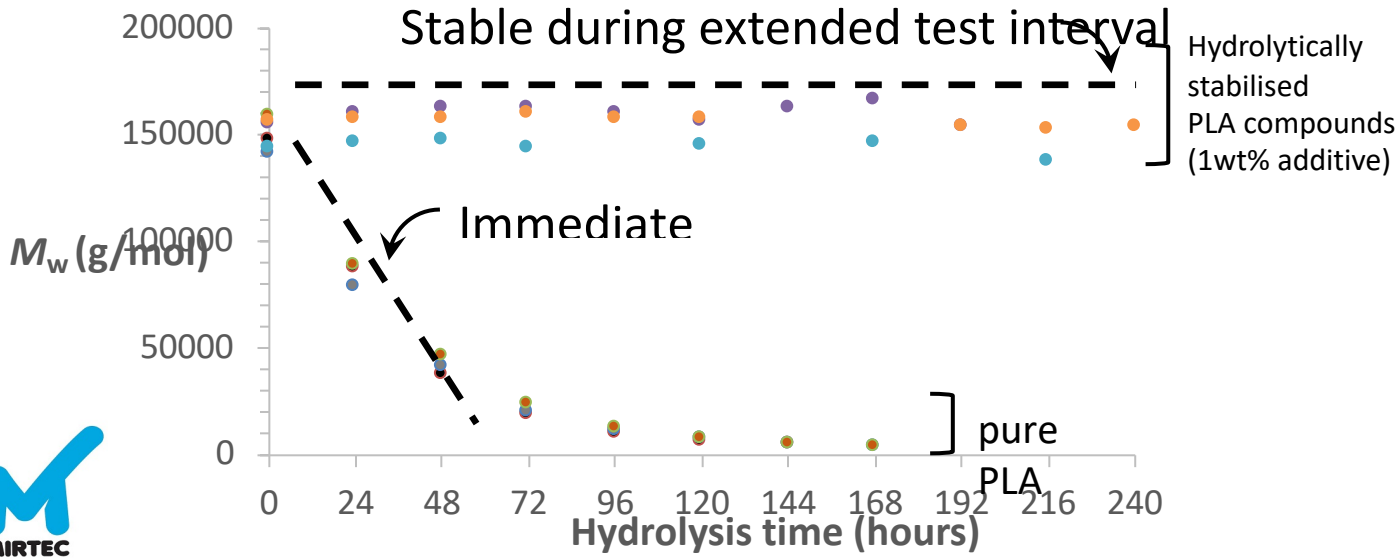
- Funding
  - Funded within H2020 (NMBP call)
  - Total project budget: € 8.05 mio, grant: € 6.77 mio.
  - Coordinator: Centexbel
  - Start: March 1st 2016
  - Duration: 40 months

This project has received funding from the European Union's **Horizon 2020** research and innovation programme under Grant Agreement No 685614

# Some key results…

# **Compound** level:
# large increase in hydrolytical stability

- Hydrolytical stabilisation needed for applications with long lifetime:
  - Various additives evaluated, *some* successful at ca. 1wt%
  - Test ‘accelerated hydrolysis’: 70°C and 80 % relative humidity
  - Key parameter: molecular weight (g/mol)



# Manufacturing and testing of prototypes

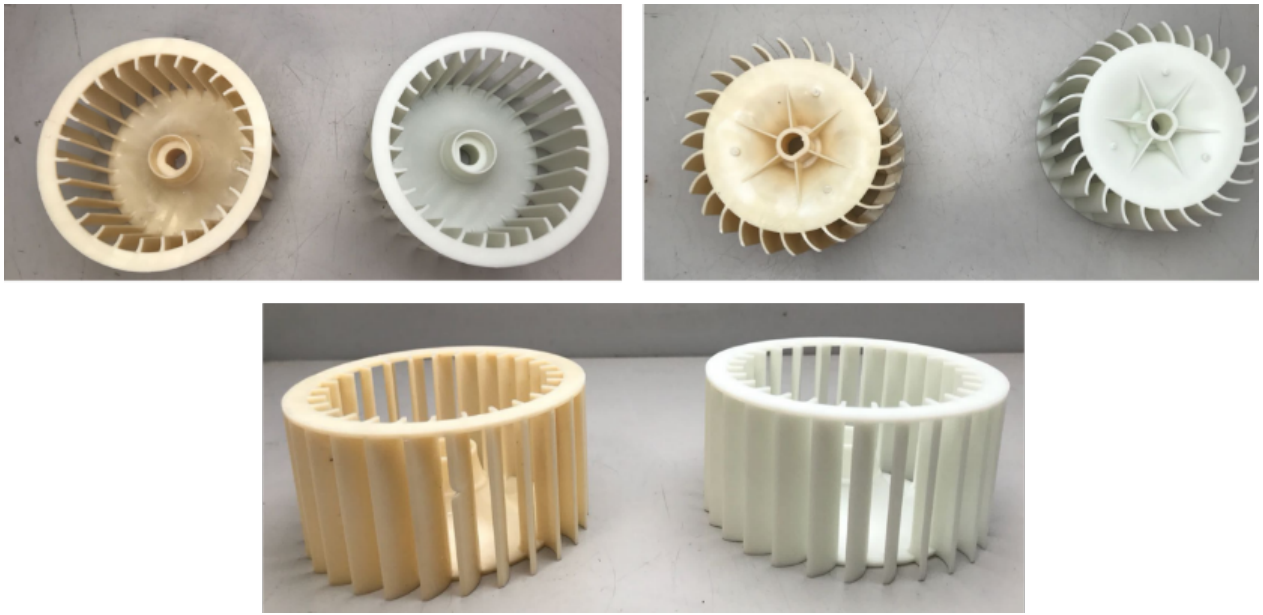
- Biobased injection moulded prototypes for automotive and white goods
- Example tumble dryer:

Bottom baseboard

Process fan

arçelik

# Prototyping – Dryer Process Fan



Dryer process fan produced: left PLA-based material and right PP-GF30 (benchmark material)

# **PLA filaments** with up to 10 GPa stiffness obtained via optimised melt extrusion

- Stiffness determined by:
  - **PLA compound**: neat vs reinforced
  - **Spinneret**: influence of the ratio capillary length - diameter (L/D ratio)
  - **Spinning speed**
  - **Cold drawing:** stretching ratio

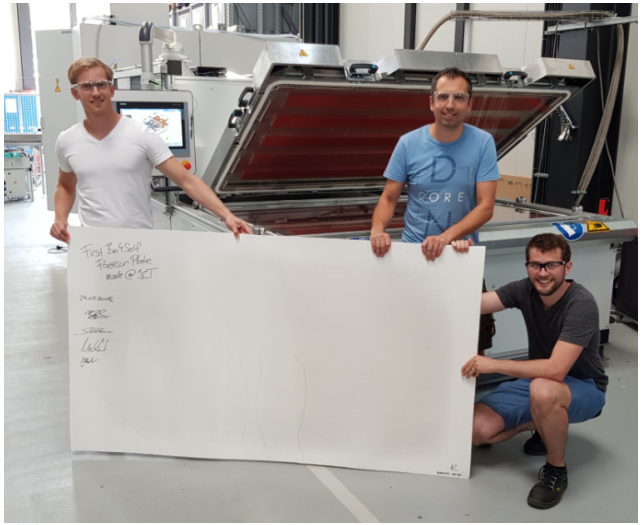
| Spinneret Type (L/D ratio) | Modulus (GPa) |
|---|---|
| 2 | 7,7 |
| 2,6 | 7,3 |
| 4 | 8,7 |

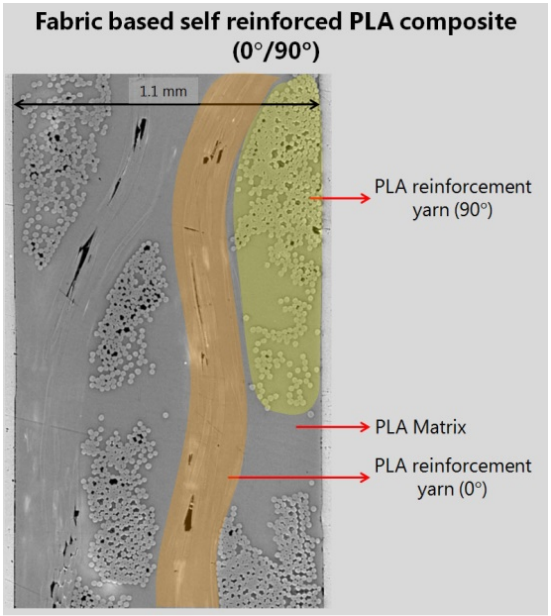
| Cold drawing (stretching ratio) | Modulus (GPa) |
|---|---|
| 1,8 x | 7,2 |
| 3,2 x | 7,8 |
| 6,1 x | 8,7 |

- **Outcome**:
  - **Multi**filament: stiffness up to 10 GPa (for 5 dtex per filament)
  - **Mono**filament: similar results (for 50 to 100 tex)

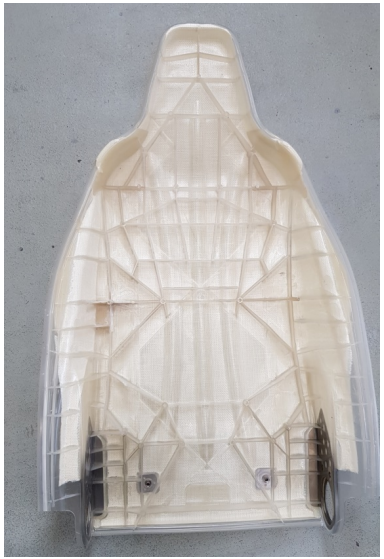
# Composite intermediates

## Consolidated srPLA plates for thermoforming





# Thermoformed car seat shell made of self-reinforced PLA



Acknowledgement to MoPaHyb project for use of the mold for the seat structure

# BIO4SELF – Further info

- Contact:
  - Guy Buyle (+32 9 243 82 53 | guy.buyle@centexbel.be )
- Website: www.bio4self.eu

# POLYBIOSKIN

Maria-Beatrice Coltelli, INSTM-UNIPI

Simona Neri, IRIS technology group

European bioplastic research network event, “Past and current H2020 projects Joined in Bioplastics research” 24-06-2020

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. **790157**.

# GENERAL OVERVIEW

***www.polybioskin.eu***


**MONTHS**

**36**

**BUDGET**

**4 M€**

**PARTNERS**

**12**

**COUNTRIES**

**7**

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. **790157**.

# GENERAL OVERVIEW

## SANITARY

### DIAPER

Flat die extrusion of topsheet

SAP production by polysaccharide modification

Topsheet surface texturing and antimicrobial modification

Advanced in vitro testing

## COSMETICS

### BEAUTY MASK

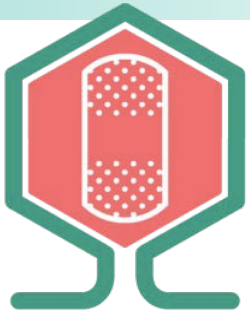
Bacterial fermentation (PHA)

Film extrusion / casting

Non woven production via electrospinning

Impregnation with natural anti oxidant nanoparticles

Advanced in vitro testing



## WOUND CARE

### WOUND DRESSING

Bacterial fermentation (PHA)

Non woven production via electrospinning

Fibre modification

Impregnation with natural anti oxidant nanoparticles

Advanced in vitro testing

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POLYBIOSKIN


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. **790157**.

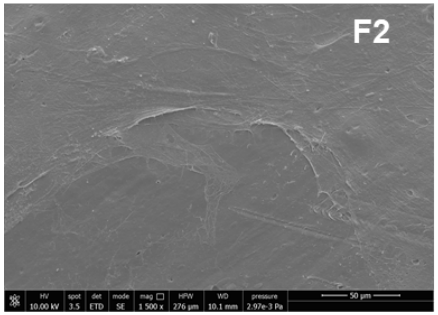
# OBJECTIVES

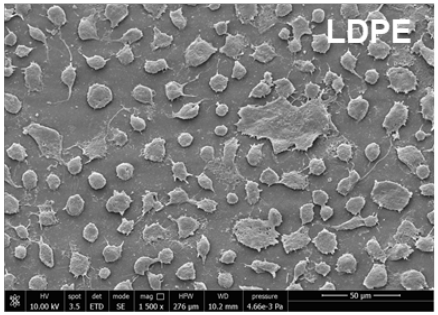
To develop and validate a fully biodegradable diaper provided with a skin-compatible surface enriched with anti-microbial and anti-oxidant functionalities to prevent skin reddening and inflammation, and with a biopolymer-based superabsorbent

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. **790157**.

# TOP-SHEET

Production of plasticized PLA/PBS blends by extrusion and of films by flat die extrusion



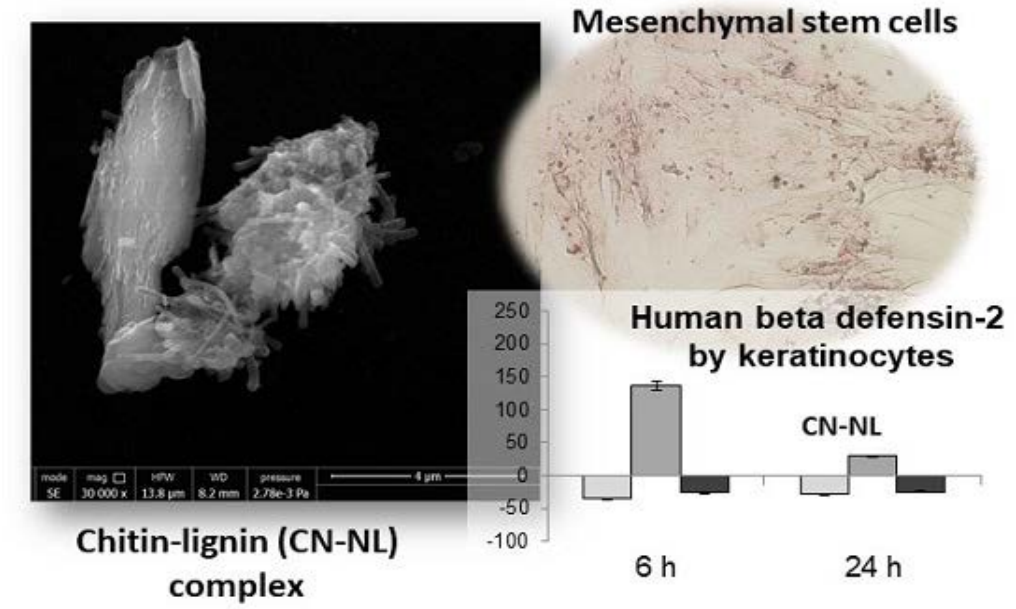



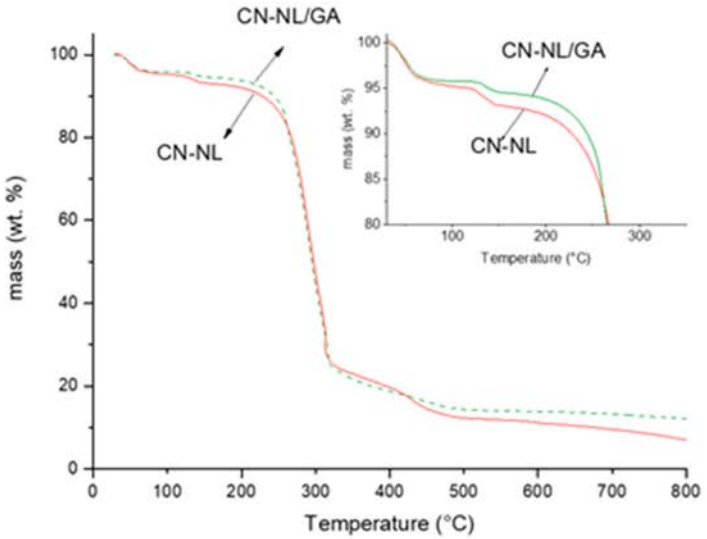

The compatibility of the films with keratynocytes and mesenchymal stromal cells was found very good, with a slight anti-microbial action due to the activation of defensins

Gigante, V.; Coltelli, M.-B.; Vannozzi, A.; Panariello, L.; Fusco, A.; Trombi, L.; Donnarumma, G.; Danti, S.; Lazzeri, A. Flat Die Extruded Biocompatible Poly(Lactic Acid) (PLA)/Poly(Butylene Succinate) (PBS) Based Films. *Polymers* **2019**, *11*, 1857.

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. **790157**.

# The excellence of POLYBIOSKIN sanitary products



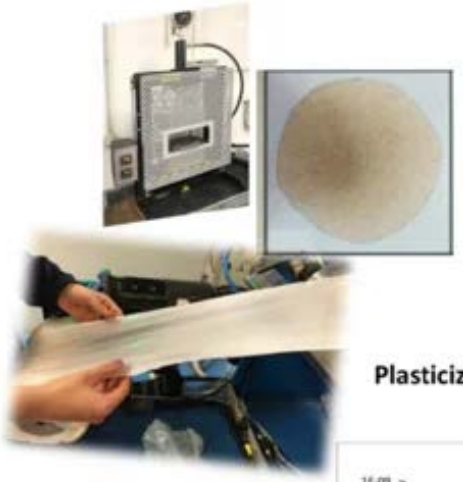

**The obtained findings demonstrate that these biocomponents are cytocompatible, show anti-inflammatory activity and may serve for the delivery of biomolecules for skin care and regeneration.**

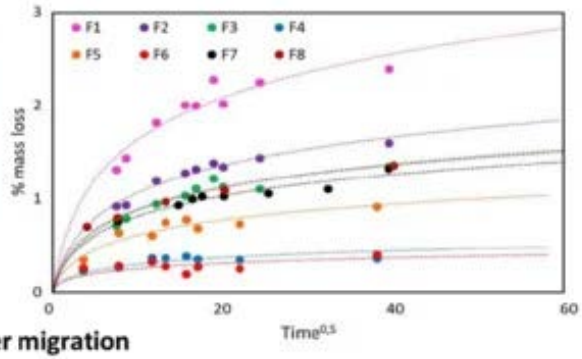
Danti, S.; Trombi, L.; Fusco, A.; Azimi, B.; Lazzeri, A.; Morganti, P.; Coltelli, M.-B.; Donnarumma, G. Chitin Nanofibrils and Nanolignin as Functional Agents in Skin Regeneration. *Int. J. Mol. Sci.* **2019**, *20*, 2669.

IRIS TECHNOLOGY GROUP
BBI JU
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. **790157**.

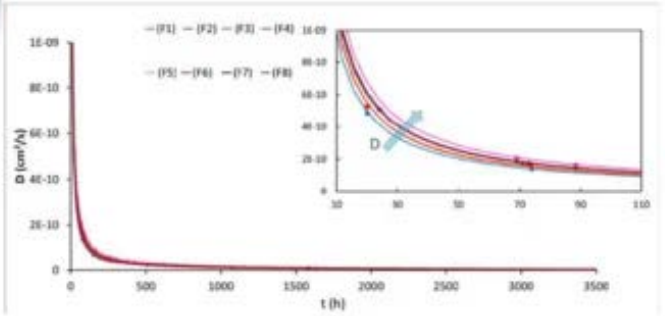
# PLASTICIZER MIGRATION FROM BIOPOLYESTER FILMS

Release in land and sea






Plasticizer migration



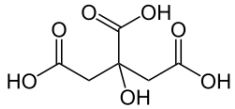

Micrometric calcium carbonate can be used to strongly limit the migration of citrate plasticizer from biopolyester films

Aliotta, L.; Vannozzi, A.; Panariello, L.; Gigante, V.; Coltelli, M.-B.; Lazzeri, A. **Sustainable Micro and Nano Additives for Controlling the Migration of a Biobased Plasticizer from PLA-Based Flexible Films.** *Polymers* **2020**, *12*, 1366.

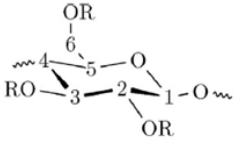
This project has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No. **790157**.

# BIO-SAP

Citric acid (10 %)



Na-CMC



DS=1.3

24h @ 20°C

24h @ 80°C

SAP membrane

grinding

SAP powder

d < 1 mm

European Polymer Journal 116 (2019) 38–44

Contents lists available at ScienceDirect

European Polymer Journal

journal homepage: www.elsevier.com/locate/europolj

## Development of a biobased superabsorbent polymer from recycled cellulose for diapers applications

Clément Lacoste*, José-Marie Lopez-Cuesta, Anne Bergeret

*Centre des Matériaux des Mines d'Alès(C2MA), IMT Mines Ales, Université de Montpellier, France*

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. **790157**.

SANITARY

**DIAPER**

Flat die extrusion of topsheet

SAP production by polysaccharide modification

Topsheet surface texturing and antimicrobial modification

Advanced in vitro testing

- Almost 100% biobased
- Increased compatibility with skin and body
- Anti-inflammatory
- Indirectly anti-microbial
- Compostable in industrial plant

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. **790157**.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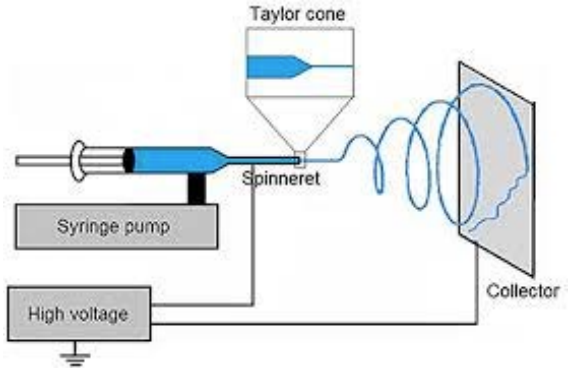
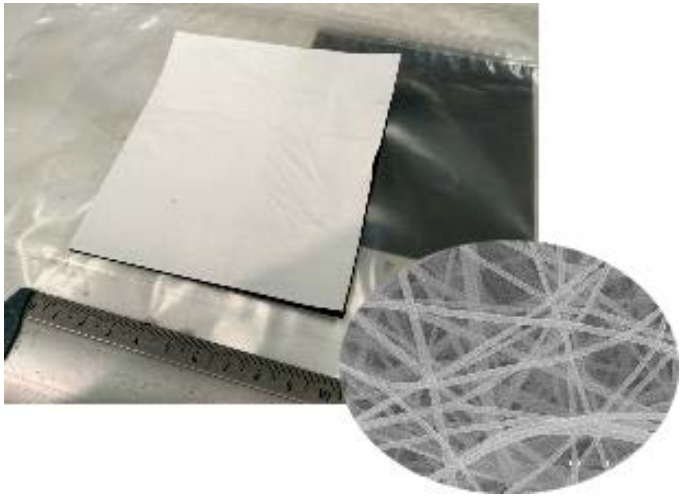
# OBJECTIVES

To develop and validate fully biodegradable and bioactive facial beauty masks based on biopolymers in the form of a film or a nonwoven tissue impregnated with formulations based on natural compounds beneficial for the skin



Polysaccharidic tissue modified by pwder impregnation

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. **790157**.

COSMETICS

**BEAUTY MASK**

Bacterial fermentation (PHA)

Film extrusion / casting

Non woven production via electrospinning

Impregnation with natural anti oxidant nanoparticles

Advanced in vitro testing

- 100% biobased
- Commercialized dry without preservatives
- Compatibility with skin and body
- Anti-inflammatory, anti-oxidant
- Indirectly anti-microbial
- Water soluble
- Compostable in industrial plant

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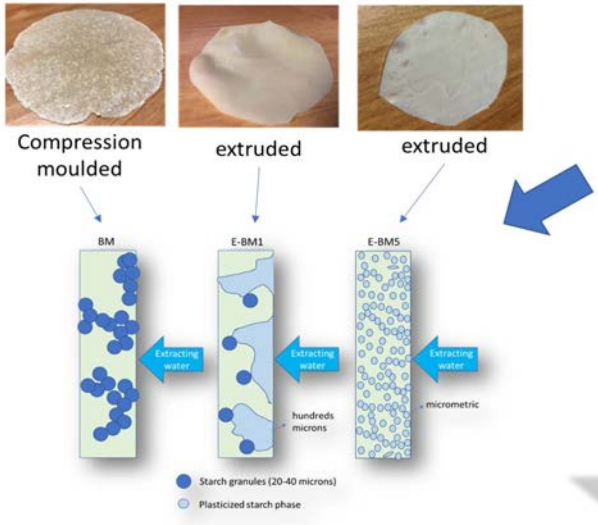
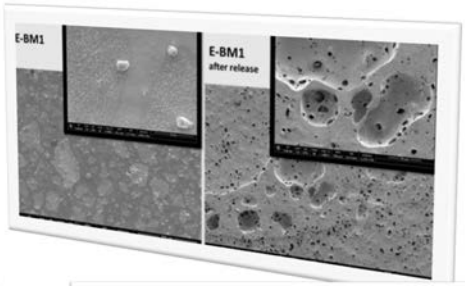
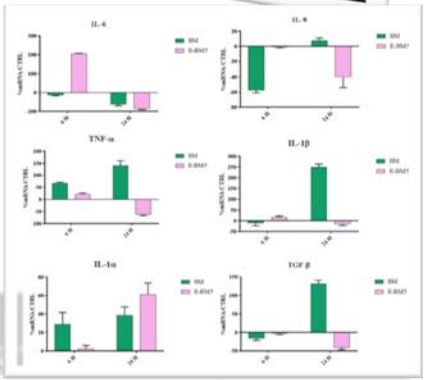
# OTHER OPTIONS INVESTIGATED

PHA/Starch films obtained by compression moulding or extrusion → starch release on the skin



Coltelli, M.-B.; Danti, S.; Trombi, L.; Morganti, P.; Donnarumma, G.; Baroni, A.; Fusco, A.; Lazzeri, A. Preparation of Innovative Skin Compatible Films to Release Polysaccharides for Biobased Beauty Masks.
*Cosmetics* **2018**, *5*, 70.

Coltelli, M.-B.; Panariello, L.; Morganti, P.; Danti, S.; Baroni, A.; Lazzeri, A.; Fusco, A.; Donnarumma, G.
Skin-Compatible Biobased Beauty Masks Prepared by Extrusion.
*J. Funct. Biomater.* **2020**, *11*, 23.

The compression-molded versions, more inhomogeneous in terms of surficial morphology, resulted in having a much stronger immunomodulatory activity compared to the extruded one

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. **790157**.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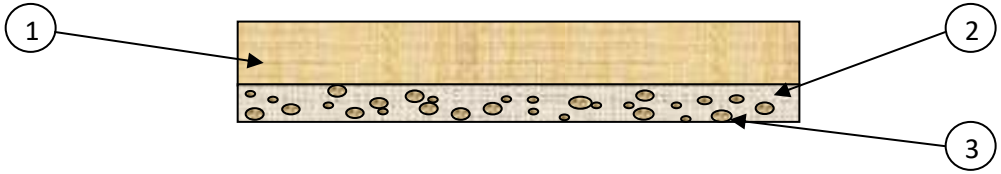
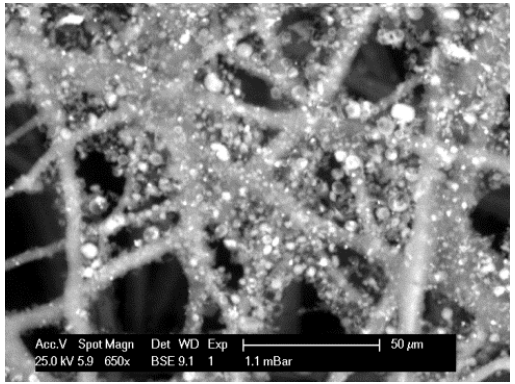
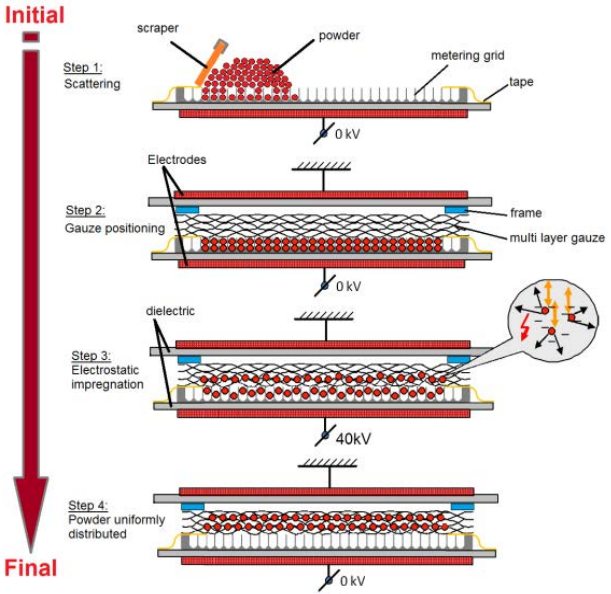
# OBJECTIVES

To develop a nanostructured biocompatible non-woven tissue to be used in wound dressing

PHA/Chitosan/PLA




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. **790157**.

Deadline for manuscript submissions:

**30 June 2020**

Journal of

*Functional Biomaterials*


an Open Access Journal by MDPI

# High Performance Functional Bio-based Polymers for Skin-contact Products

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. **790157**.

# POLYBIOSKIN PRODUCTS END OF LIFE


**Current scenario**

- Top-sheet in PE or fossil/nat fibers
- SAP in NaPolyacrylate

WM: landfill or incineration
(recycling under study in EMBRACED)

**POLYBIOSKIN scenario**

Top-sheet biobased and compostable SAP in modified cellulose
WM: recycling (integration in EMBRACED technologies?), composting or anaerobic digestion

**Current scenario**

Cotton + fossil fibers→ microplastics

WM: landfill

**POLYBIOSKIN scenario**

Water soluble polysaccharidic beauty mask

WM: biological depuration of wastewater

(compostability)

**Current scenario**

polyurethane (PU), absorbent foam PU, absorbent core carboxymethyl cellulose or alginate, silicone adhesive, of silicone, coating silver as anti-microbial

WM: landfill or incineration

**POLYBIOSKIN scenario**

Chitosan/PHA/PLA

WM: Recycling (to be investigated), composting, anaerobic digestion

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. **790157**.

# LESSONS LEARNED

-A platform of biobased molecules with anti-microbial and anti-oxidant properties can be exploited to improve materials properties in a healthy way

-Biopolyester blends can be used in sanitary, cosmetic and biomedical applications thanks to their improved biocompatibility

-The biobased and biocompatible option outperform fossil based materials for the easier end of life

- Collaboration between research entities, institutions and waste management companies is reccomended for exploiting these last potentialities

- In the cases where recycling is possible and sustainable, more investigations should be promoted

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. **790157**.

VIRTUAL MEETING:

# "Past and Current H2020 Projects Joined in Bioplastics Research"

HAW Hamburg introduces:

## BIO-PLASTICS EUROPE

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 860407
BIO-PLASTICS EUROPE project website: https://bioplasticseurope.eu/

# BIO-PLASTICS EUROPE

## Developing and Implementing Sustainability-Based Solutions for Bio-Based Plastic Production and Use to Preserve Land and Sea Environmental Quality in Europe

**October 2019 – September 2023**

Project kicked-off in October 2019

# Partners


22 partners
13 countries
8.5 million Euros

HAW Hamburg
ABM COMPOSITE
acib austrian centre of industrial biotechnology
BIOplastiche
AWI
Fraunhofer LBF
HENG HIAP
HWWI
ivl SVENSKA MILJÖINSTITUTET
ktu
Manchester Metropolitan University
NaturePlast
ecoembes
prospex
TAL TECH
TUHH Technische Universität Hamburg
TURKU AMK TURKU UNIVERSITY OF APPLIED SCIENCES

BIO PLASTICS EUROPE

# The main objective:

***To develop sustainable strategies and solutions for bio-based plastic products, as well as the to develop approaches focused on circular innovation for the whole bioplastics system. These may be deployed to support policy-making, innovation and technology transfer.***

Objective 6:
Communication Strategy
+ cooperative knowledge sharing of Best Practices and Lessons Learned
WP9

BIO PLASTICS EUROPE

**WP1:** Ethics

**WP2:** Project Management

**WP3:** Identification and tests of innovative product design

**WP4:** Plastic waste collection, recycling, and littering

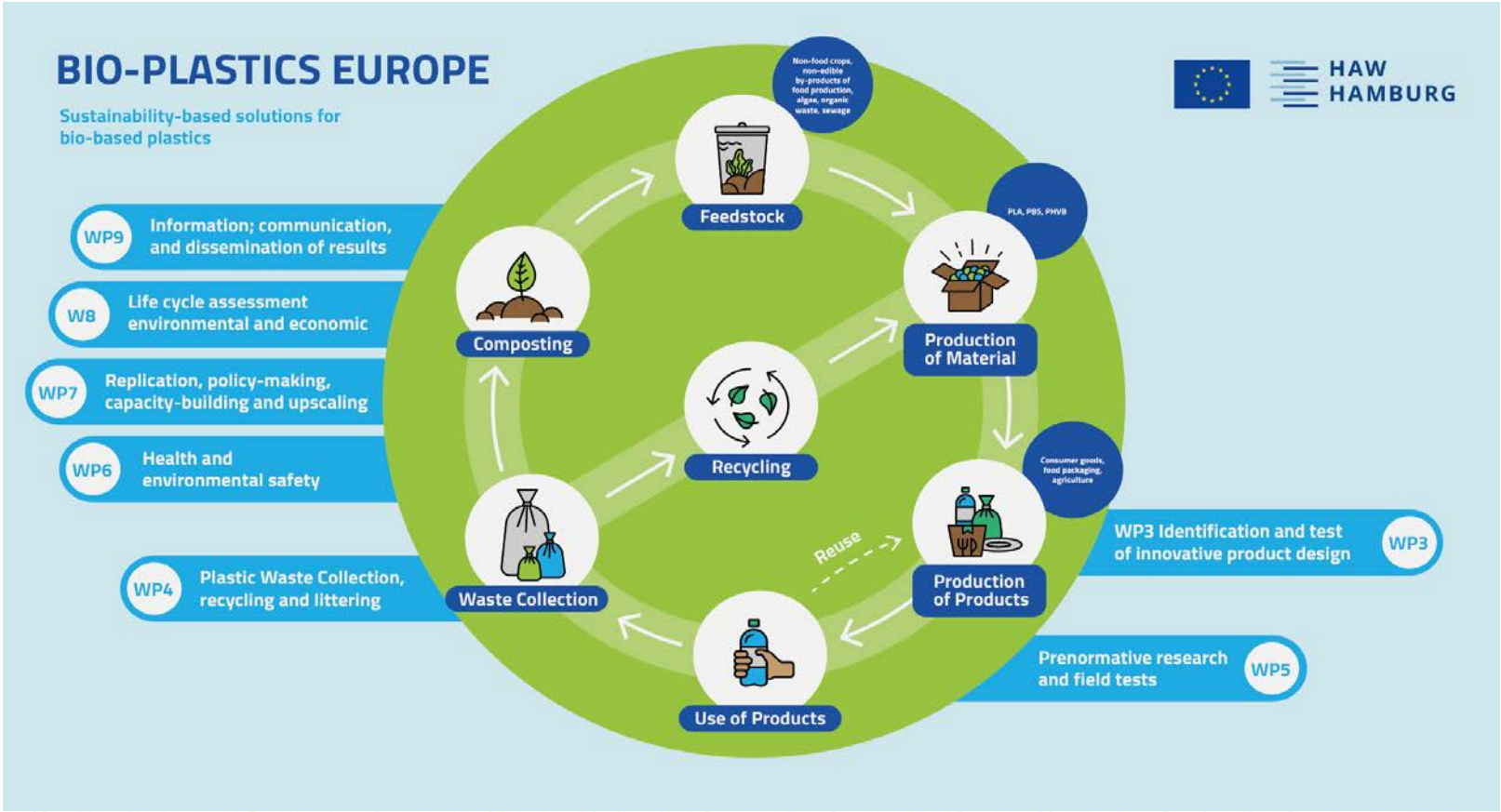
**WP5:** Pre-normative research and field tests

**WP6:** Bio-based plastic safety components

**WP7:** Replication, policy-making, capacity-building and upscaling

**WP8:** Environmental and economic assessments of product life cycles and business models

**WP9:** Information, communication and dissemination of the results




BIO PLASTICS EUROPE

# Where we stand now….


D.3.2. Definition of Requirements for the Production of Bio-based plastics

D.4.1. Comprehensive report on plastics waste collection and management

D.7.1. Documented economic analysis (report of gap and swot analysis) of the bioplastics business model

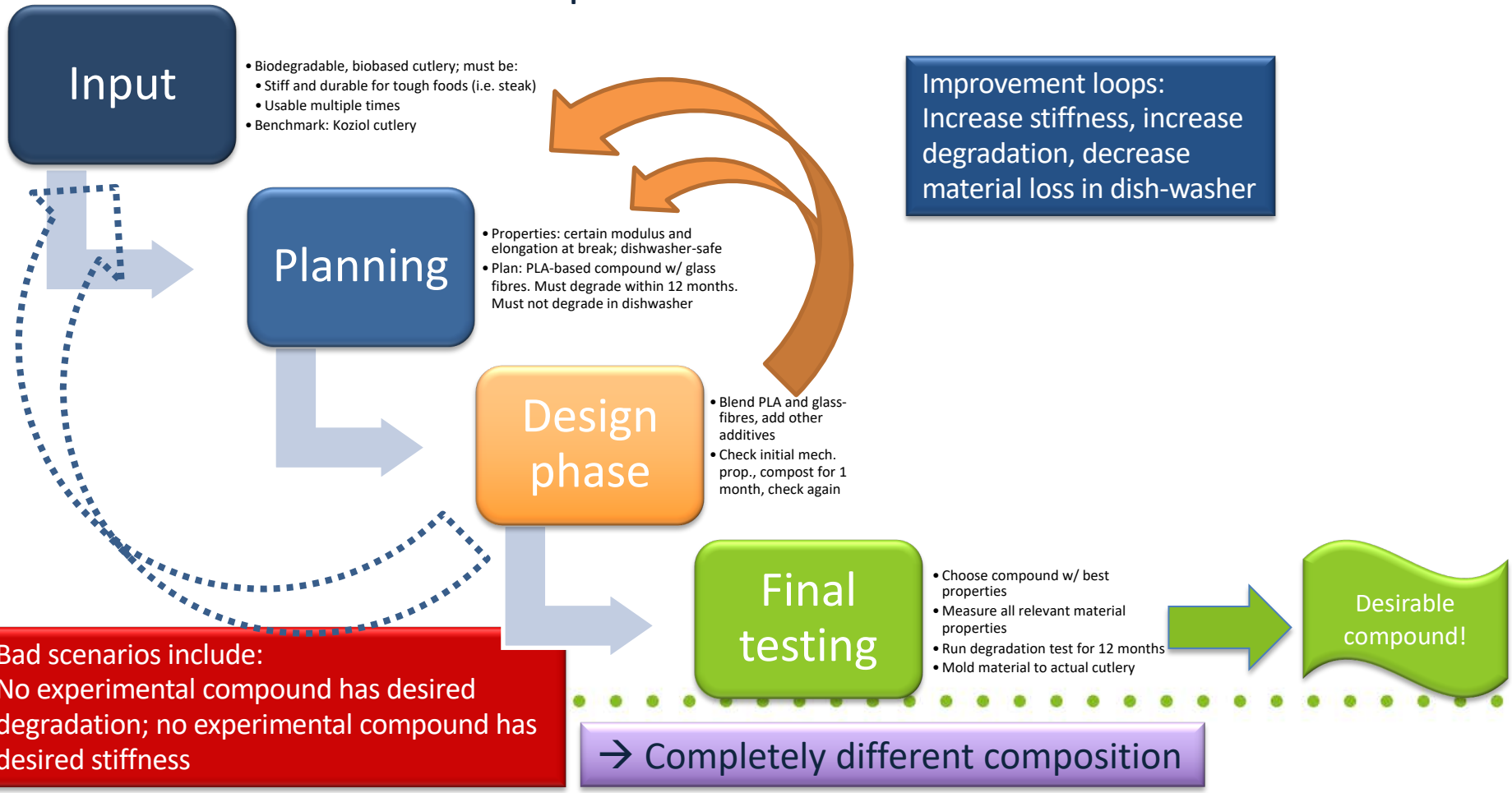
*Within the BIO-PLASTICS EUROPE project, the following end-products are experimented:*

- **PACKAGING (rigid and flexible)**
- **TOYS**
- **AGRICULTURAL MULCH FILM**
- **CUTLERY**
- AQUATIC MATERIAL ---- ***developing ***

First group of materials developed

BIO PLASTICS EUROPE

# Outline of Technical Development with Product Idea for BIO-PLASTICS EUROPE



**SECOND GROUP OF MATERIALS:**
*AQUATIC MATERIALS*
**** developing ****

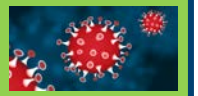
**FIRST GROUP OF MATERIALS:**
*The materials under investigation are:*

1. ***Flexible packaging:*** *PBS based compound (PBE 003+mineral filter)*
2. ***Rigid packaging****: PLA based (PLA-Mi)*
3. ***Toys****: PHBV based (PHI 002+impact modifier)*
4. ***Mulch film****: PLA based (NP-SF-141)*
5. ***Cutlery****: PLA based (ArcBiox™SGF20-B2000)*

*From this list mainly PLA is already commercially in use and well available according to very recent application notes from various companies.*

**SENT FOR LABORATORY AND FIELD TESTS**

- **Samples prepared**
- **Test Protocols almost finished**
- **Tests start 1st of September**



BIO PLASTICS EUROPE

## Field conditions

HAW (DE) – freshwater (River Elbe) and recycling facilities (biocompost)
IVL (SE) – temperate marine-brackish water (North Sea, coastal)
CNR, SCITEC and IBF (IT) - marine water (Mediterranean Sea)
CNR, IPCB (IT) - land
TUL (PL) – land, in soil
TUHH (DE) - recycling facilities (biocompost)

## Controlled conditions

AWI (DE) - in vitro (enzymes)
TUAS (FIN) - anaerobic digestion processes (lab/plant)
TICASS (IT) - recycled bio-based materials
TALTECH (EE) - composting
AMB (FIN) - WP3
NATUREPLAST (FR) - WP3
HENG HIAP (MY) - WP3

## Uptake and Effects on biota

AWI (DE) – marine invertebrates
IVL (SE) – marine invertebrates
TUL (PL) – terrestrial plants and invertebrates

# Besides focusing on research….

# NETWORKS


**LinkedIn: over 100 members**
**Preparing events**
**Foster communication**
**Share experience**

First event 17th of September

**Connect cities**
**Preparing events**
**Exchange experience**
**Offer solutions**


BIO PLASTICS EUROPE

# STAKEHOLDER ENGAGEMENT

12 ONLINE STAKEHOLDER PROMOTION EVENTS


September – December 2020

PROMOTE PROJECT
CLUSTER stakeholders
FUTURE INVOLVEMENT

BIO PLASTICS EUROPE

# THANK YOU FOR ENGAGING WITH US…..

**HAMBURG UNIVERSITY OF APPLIED SCIENCES**

Research + Transfer Centre „Sustainability & Climate Change Management“ (FTZ-NK)
Ulmenliet 20 / 21033 Hamburg / Germany
T +49 40 428 75 6362 (Mon - Fri 8AM-3PM)
Email: bioplastics@ls.haw-hamburg.de
Website: https://bioplasticseurope.eu/

…… THANK YOU FOR YOUR ATTENTION!

BIO PLASTICS EUROPE

HAW Hamburg

Horizon 2020

SEALIVE

Strategies of circular Economy and Advanced bio-based solutions to keep our Lands and seas alIVE from plastics contamination

# Introduction to SEALIVE project

VIRTUAL MEETING: "Past and Current H2020 Projects Joined in Bioplastics Research"

24th June, 2020

**Miriam Gallur-** Packaging and Materials Technological Area Manager (ITENE)

This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under grant agreement No 862910 (SEALIVE). This output reflects only the author's view and the European Union cannot be held responsible for any use that may be made of the information contained therein.

# Outline

1. The need
2. General Objective
3. Circular concept
4. Partners

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# The need: Reduce plastic pollution

Plastic litter in Europe (plastics in purple, size indicates level)
*Source: AWI-Literbase, 2018*

**THE UNINTENDED IMPACTS OF PLASTICS ON SOCIETY AND THE ENVIRONMENT**

- Plastic is an important and ubiquitous material in our economy and daily lives.
- There are growing concerns and mounting evidence that plastics also considerably affect environmental and human health.
- These unintended effects have been caused mainly by the plastic waste pollution.
- Most Europeans are worried about the environmental impact of plastics (87 %) and (74 %) of them worried about its impact on their health.

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# SEALIVE General Objective

To develop ***innovative and sustainable business models*** to put in the market **advanced *bioplastics solutions*** by combining ***new biopolymers sources*** with ***cutting-edge processing technologies***, offering unexploited opportunities for circular economy solutions involving **design for circularity techniques.**

A variety of ***end-of-life solutions*** including ***recycling, marine biodegradation and composting*** **to avoid plastics ending-up on land and sea** will be improved and new ones will be developed targeting to build up a ***strong reference framework for the policy makers and harmonisation.***

**SEALIVE general objective** will directly support ***the Plastics Strategy set by the EC.***

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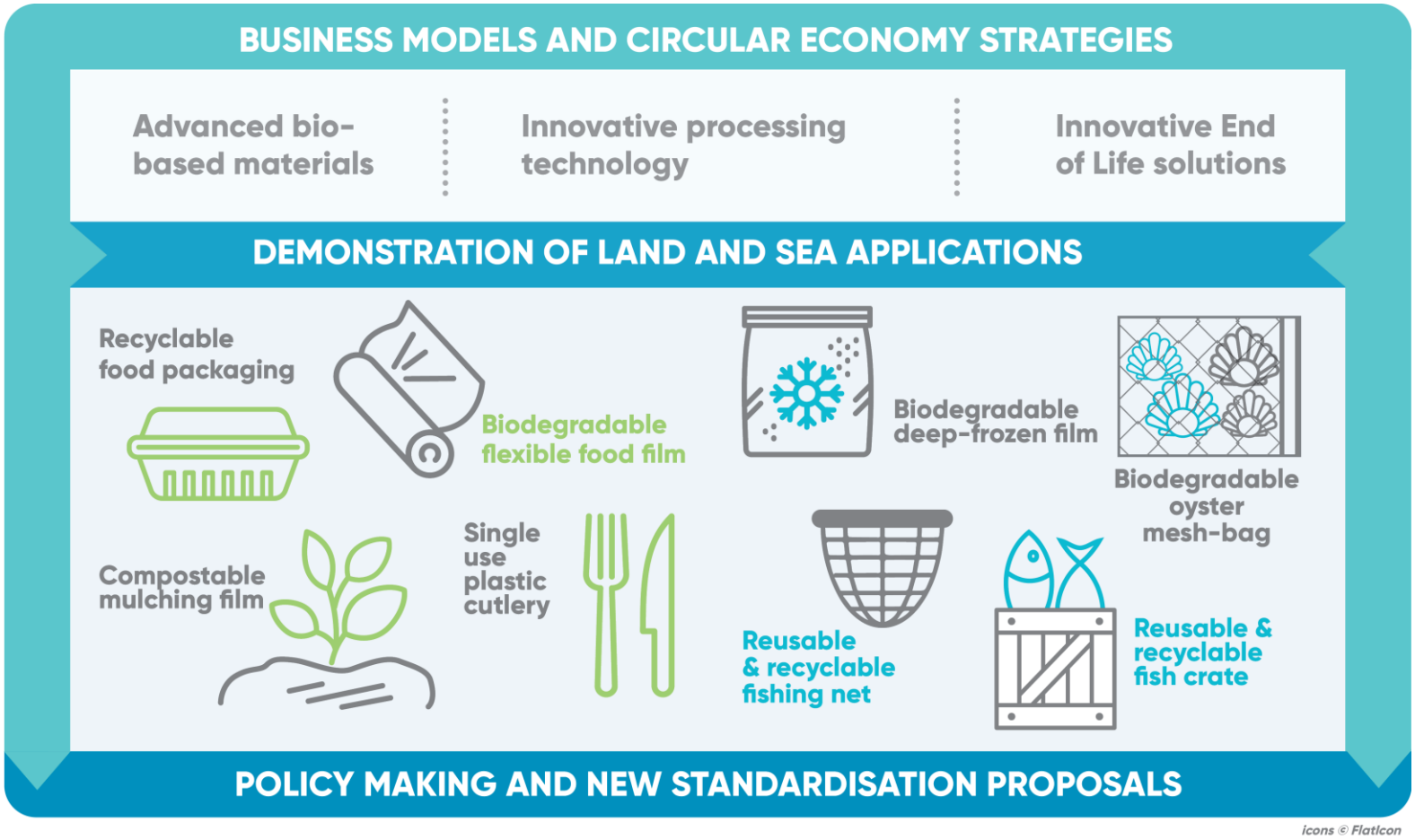
# SEALIVE General Objective

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# SEALIVE General Objective

## 6 Different territories

### D1. Demonstration in Spain

Demonstration and validation of the biodegradability standards of rigid and flexible packaging in composting

### D2. Demonstration in Belgium

Real-life composting process of mulching films

### D3. Demonstration on the Mediterranean Sea

**Fishing nets** evaluation in the waters of Cyprus

### D4. Demonstration in Patagonian Sea

**Fishing nets developed will be validated in the Patagonian sea.**

### D5. Demonstration in Atlantic Ocean

**Oyster mesh bags to test the functionality**

### D6. Demonstration on the Celtic Sea region


Fishing crates will be to a selection of local users and trialled in Irish ports to test their functionality

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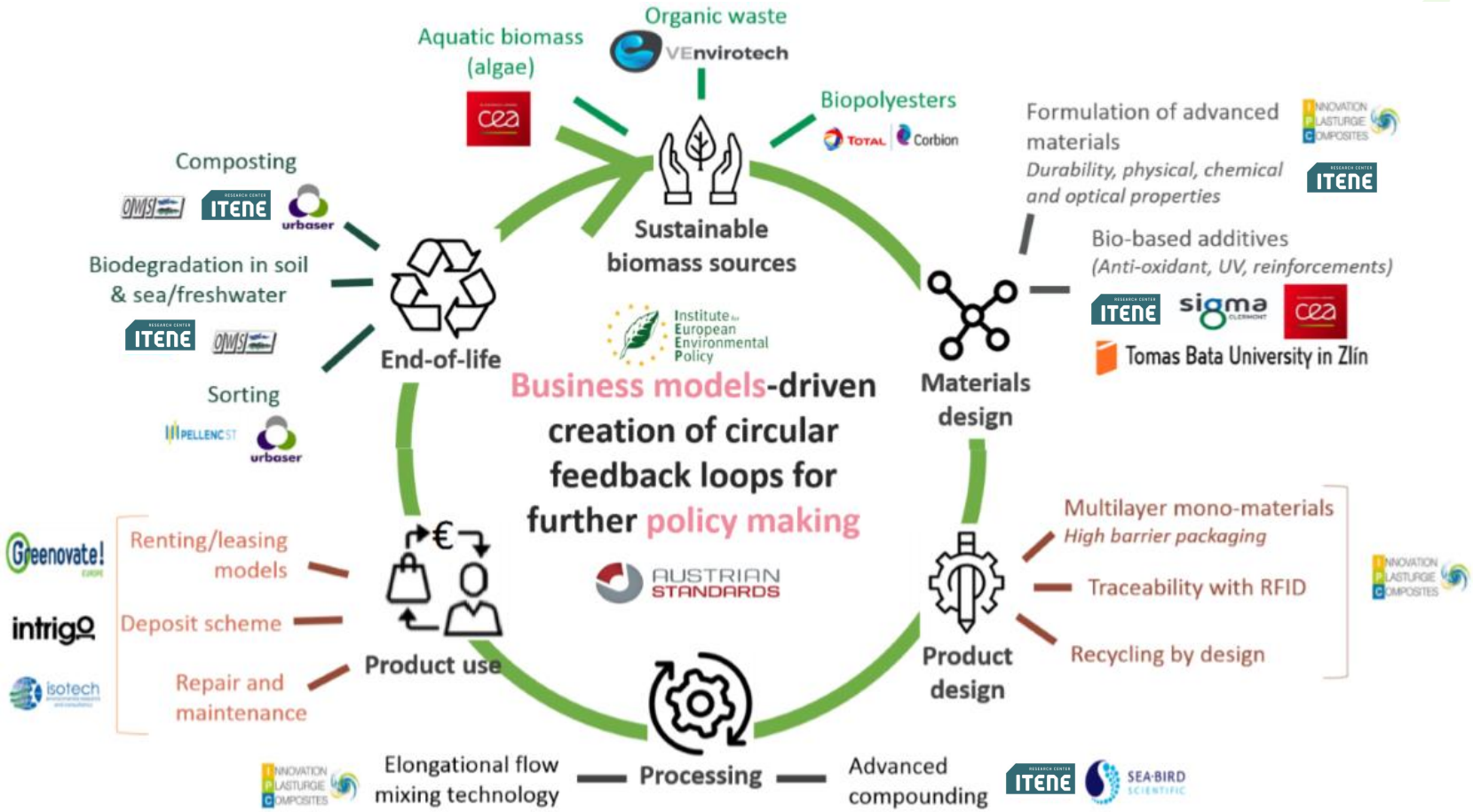
# SEALIVE is a circular cooperation project

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# Partners:

24 partners, 11 countries

DIFFERENT TYPES OF ORGANIZATIONS: SMEs, Industry, academy, research centres and NGOs


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# SEALIVE

**S**trategies of circular **E**conomy and **A**dvanced bio-based solutions to keep our **L**ands and seas al**IVE** from plastics contamination

# Thank you


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Email: annette@intrigo.eu



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cidetec
surface engineering

# ECOXY

## Bio-based recyclable, reshapable and repairable (3R) fibre-reinforced EPOXY composites.

ECOxy

Dra. Aratz Genua
Polymers & Composites

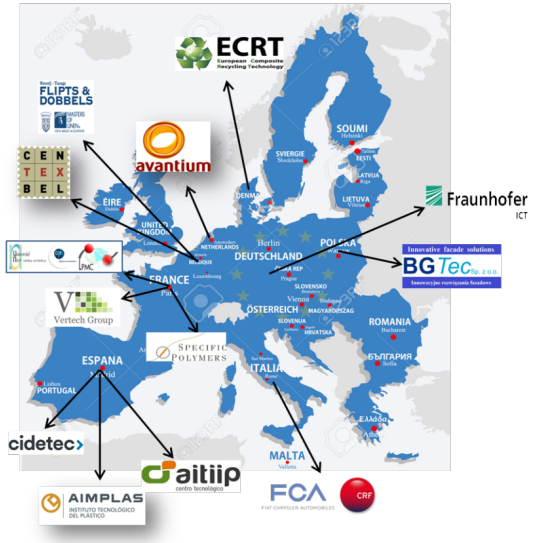
24/06/2020

© CIDETEC 2020

# ECOXY PROJECT

Bio-based recyclable, reshapable and repairable (3R) fibre-reinforced EPOXY composites for automotive and construction sectors. Project ID 744311.

- BBI-RIA action (BBI-2016-R07 topic). 01/06/2017-30/11/2020.
- Consortium is formed by 13 partners from 8 EU member countries.



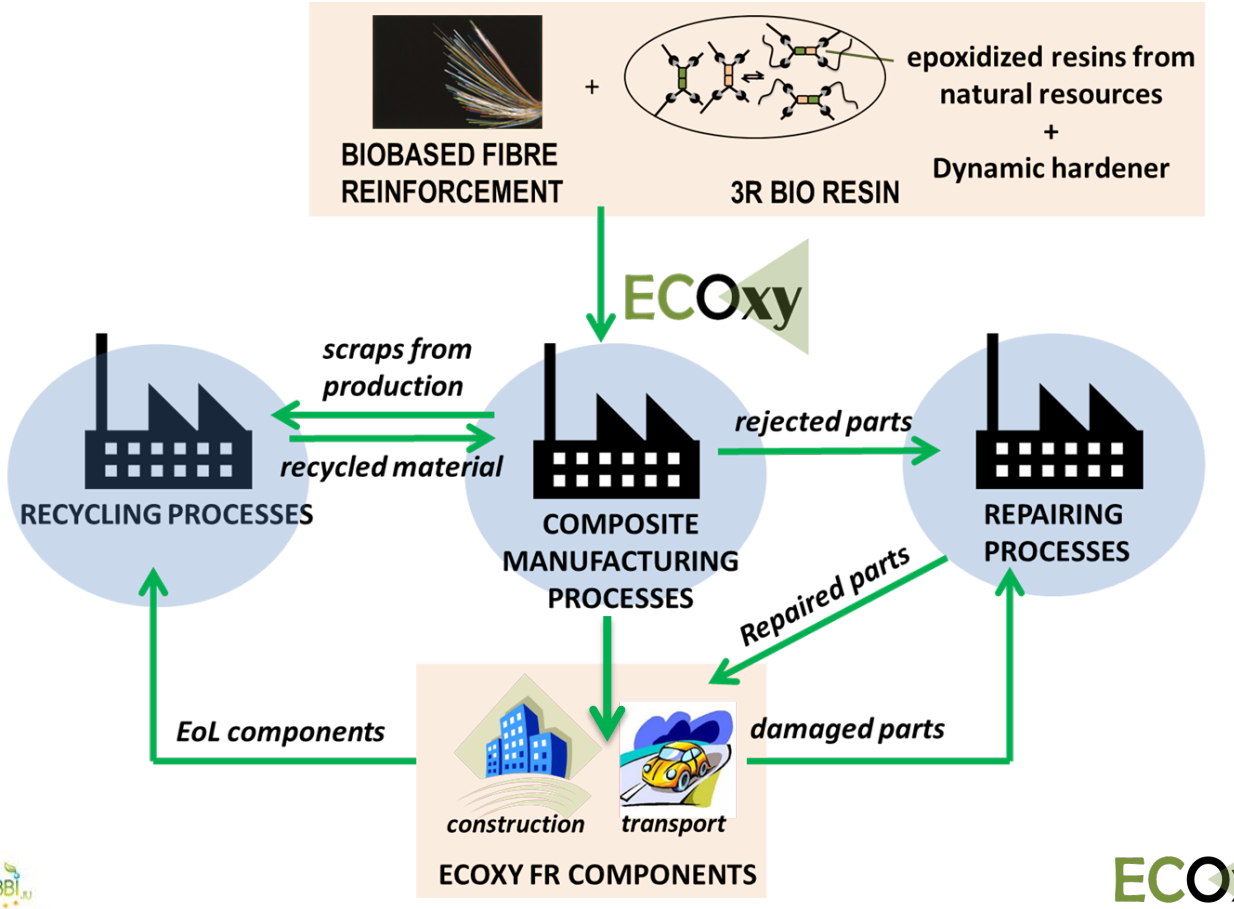

- 5 SME


- 6 Research Institutes


- 1 University


- 1 Private Consultant

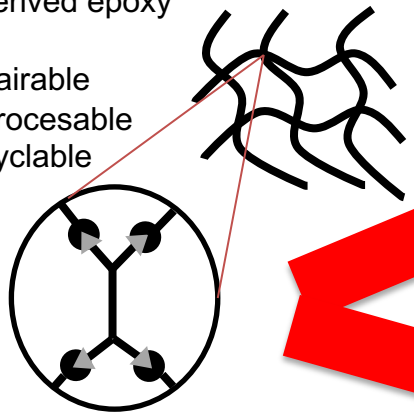
# ECOXY CONCEPT



# ECOXY BENEFITS & ADVANTAGES

*Conventional thermoset resin:*

- ❖ Fossil derived epoxy resin
- ❖ Non repairable
- ❖ Non reprocesable
- ❖ Non recyclable



Conventional covalent crosslinks in conventional epoxy resins

# ECOXY BENEFITS & ADVANTAGES

*Conventional thermoset resin:*

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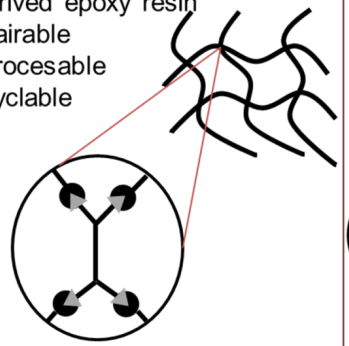
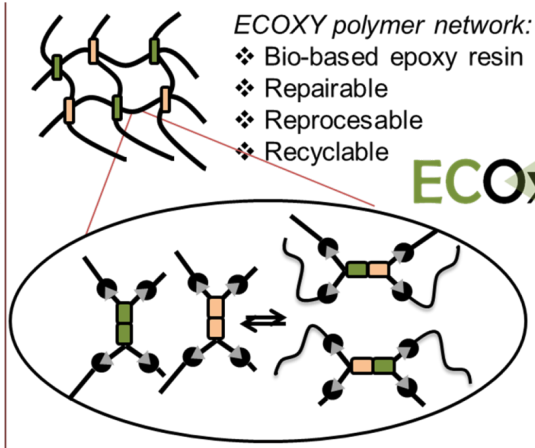


Conventional covalent crosslinks in conventional epoxy resins

*ECOXY polymer network:*

- Bio-based epoxy resin
- Repairable
- Reprocesable
- Recyclable



Dynamic chemical crosslinks in ECOXY functional resins

- **REPAIRABLE**
- **REPROCESSABLE**
- **RECYCLABLE**
- **BIO-BASED**

# ECOXY MAIN CHALLENGES

- To develop bio-based epoxy resins for substituting DGEBA (with the same or improved properties).
- These resins must react with the selected dynamic hardener for obtaining the so-called bio-based 3R thermoset matrix.
- These 3R matrix will be reinforced with bio-based fibres (flax and PLA fibre reinforcements) for manufacturing demonstrators for the automotive and construction sectors.

**BIO-BASED 3R THERMOSET COMPOSITES FOR THE AUTOMOTIVE & CONSTRUCTION SECTORS.**

- **AUTOMOTIVE SECTOR**

Seat back panel

*Seat back panel made from ECOXY material (fibres and resin)*

- Wet compression moulding process optimized for the developed resin and fibres.
- First demonstrator manufactured with these materials.
- Manufacturing of more demonstrators ongoing for their validation.

- **CONSTRUCTION SECTOR**

pultruded window profiles' geometry

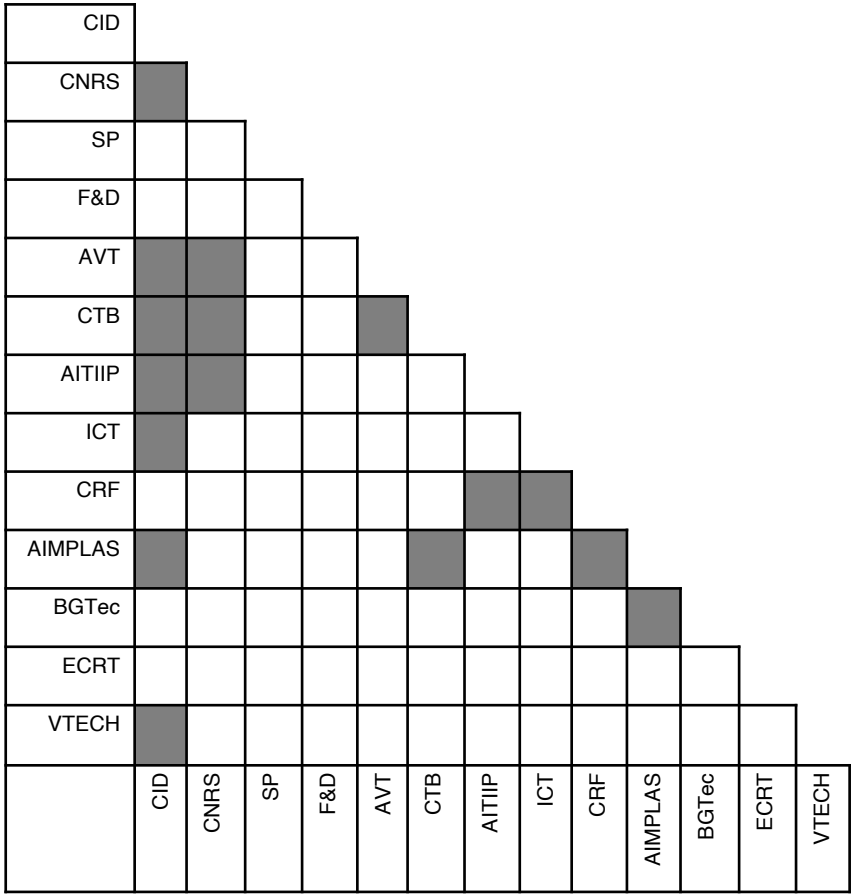
pultruded window section

*Square profile, tests have been successfully made with bio-based epoxy and flax fibers combined with glass fibers*

- Pultrusion process is being optimized for the bio-based materials.
- Flat profiles and square profiles have been succesfully manufactured.
- Window profiles will need to be done with glass fibre, due to the high temperatures achieved within the pultrusion process.

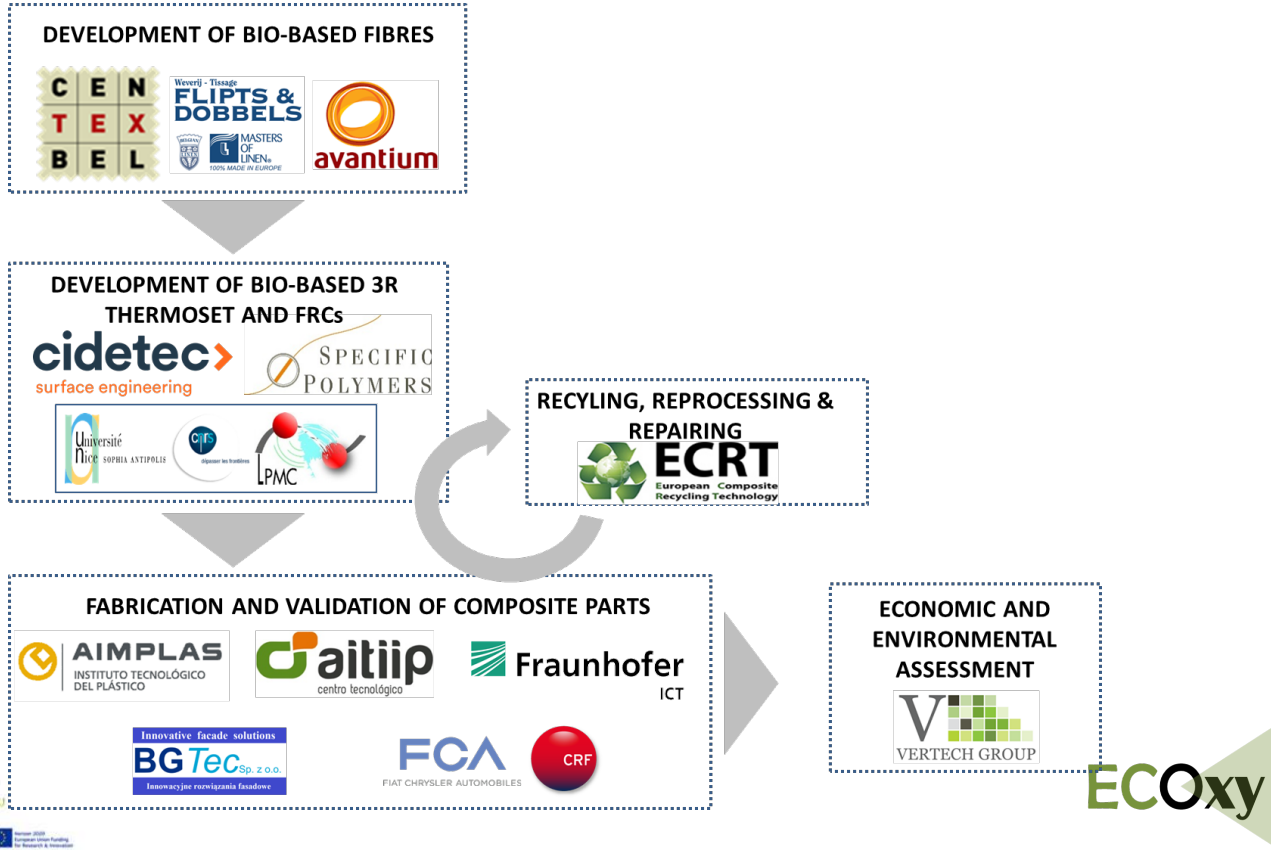
# ECOXY. CONSORTIUM COLLABORATION

- Some partners had already worked together in other relevant projects:



# ECOXY. CONSORTIUM COLLABORATION

- Collaboration is bein good within the project, partners are working together throughout the whole value chain of the project:



# Bio-based plastics Research and Innovation Ambitions of European Commission

**Silvia Maltagliati**
**Policy officer – Seconded National Expert**
**DG.RTD.C1 "Circular economy and bio-based systems"**
**Nila Petralli**
**Project adviser**
**Research Executive Agency B2 "Sustainable Resources for Food Security and Growth"**

Research and Innovation

# CE-BG-06-2019: Sustainable solutions for bio-based plastics on land and sea

*Scope of the topic:*

*i) facilitate efficient **reuse and recycling** of bio-based plastics*

*ii) contribute to building a sustainability framework for **biodegradability on land and at sea (NO OXO)***

*iii) International fora

*Bio-based plastics: "wholly or partly derived from

# EU 2018 Plastic Strategy

Curbing plastic waste and littering

*"Establishing a clear regulatory framework for plastics with biodegradable properties"*

Driving innovation and investment towards circular solutions

*"The Commission is particularly attentive to innovation on materials that fully biodegrade in seawater and freshwater and are harmless for the environment and ecosystems."*

# Directive (EU) 2019/904 on the reduction of the impact of certain plastic products on the environment

***Art.15***

*- criteria or a standard for biodegradability in the marine environment (scientific and technical progress)*

- *applicable to single-use plastic products*
- *does not harm marine life and does not lead to an accumulation*

# REGULATION (EU) 2019/1009 laying down rules on the making available on the market of EU fertilising products

*European Commission shall assess:*

- *biodegradability criteria for polymers used as coating agent*
- *possibility of determining biodegradability criteria of mulch films*

Research and Innovation

# Environmental and Health Risks of Microplastic Pollution

## Group of Chief Scientific Advisors 2019

European Commission's Scientific Advice Mechanism (SAM)

Group of Chief Scientific Advisors

*provides recommendations to policy on fighting pollution from microplastics, based on scientific evidence including on biodegradability*

Research and Innovation

# European *Green Deal 2019*

- *all packaging in the EU market is reusable or recyclable by 2030,*
- *regulatory framework for biodegradable and bio-based plastics*
- *measures on single use plastics.*

**CEAP 2020**

*A- sourcing, labelling and use of bio-based plastics*

*B - use of biodegradable or compostable plastics…labelling a product as 'biodegradable' or 'compostable'*

Research and Innovation

# Agricultural plastics, conventional vs biodegradable
## DG ENV

*objective*

- *Policy recommendations*
- *Conventional reusable/recyclable*
- *Biodegradable in soil*

Research and Innovation

# Biodegradability of plastics in the open environment

## Group of Chief Scientific Advisors 2020

*objective*

- *applications where biodegradable plastics beneficial to the environment*

- *compared to non-biodegradable plastics*

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# Horizon Europe 2021-2027

## Pillar 1
**Excellent Science**

- European Research Council
- Marie Skłodowska-Curie Actions
- Research Infrastructures

## Pillar 2
**Global Challenges and European Industrial Competitiveness**

Clusters
- Health
- Culture, Creativity and Inclusive Society
- Civil Security for Society
- Digital, Industry and Space
- Climate, Energy and Mobility
- Food, Bioeconomy, Natural Resources, Agriculture and Environment

Joint Research Centre

## Pillar 3
**Innovative Europe**

- European Innovation Council
- European innovation ecosystems
- European Institute of Innovation and Technology

## Widening Participation and Strengthening the European Research Area

- Widening participation and spreading excellence
- Reforming and Enhancing the European R&I system

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# Mission areas

Adaptation to climate change, including societal transformation

Healthy oceans, seas, coastal and inland waters

Cancer

Climate-neutral and smart cities

Soil health and food

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# Proposed partnerships


[Circular bio-based Europe: Sustainable, inclusive and circular bio-based solutions]

**Water4All: Water security for the planet**

**A climate neutral, sustainable and productive Blue Economy**

**Towards more sustainable farming: agro-ecology living labs and research infrastructures**

**Agriculture of Data**

**Safe and Sustainable Food System for People, Planet & Climate**

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# Cluster 6: Food, Bioeconomy, Natural Resources, Agriculture and Environment

Areas of intervention:

| | |
|---|---|
| **IA1** | **Environmental observation** |
| **IA2** | **Biodiversity and natural resources** |
| **IA3** | **Agriculture, forestry and rural areas** |
| **IA4** | **Seas, oceans and inland waters** |
| **IA5** | **Food systems** |
| **IA6** | **Bio-based innovation systems** |
| **IA7** | **Circular systems** |

# IA6 Bio-based innovation systems

*"Orientations towards the first Strategic Plan for Horizon Europe Bio-based Innovation Systems – October 2019"*

- *resilience and sustainable biomass*
- *balanced ecosystems*
- *advanced sustainable biorefineries*
- *bio-based products; longer-term uses, new end-of-life, lower environmental toxicity, new functionalities*
- *transition from a linear fossil-based economy into a circular bio-based economy*
- *safe planetary boundaries*


- ***Horizon Europe legal base*** *still being finalised, adoption depending mainly on MFF*
- ***'Orientation document'*** *reflects outcome of broad co-creation process with external stakeholders, Member States and Commission services (final version published in December 2019); includes key elements for Strategic Plan*
- ***Strategic Plan*** *being prepared according to legal base requirements; main responsibility with the Strategic configuration; under drafting*
- ***Work programme*** *to follow end 2020-beginning 2021*

# THANK YOU

- https://ec.europa.eu/commission/news/eu-plastics-strategy-2018-nov-20_en
- https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0904
- https://op.europa.eu/en/publication-detail/-/publication/f235d1e3-7c4d-11e9-9f05-01aa75ed71a1/language-en/format-PDF/source-108645429
- https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R1009&from=EN
- https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
- https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan.pdf
- https://ec.europa.eu/info/research-and-innovation/strategy/support-policy-making/scientific-support-eu-policies/group-chief-scientific-advisors/biodegradability-plastics-open-environment_en
- https://ec.europa.eu/info/sites/info/files/research_and_innovation/strategy_on_research_and_innovation/documents/ec_rtd_he-orientations-towards-strategic-plan_102019.pdf