HEMP IN A BOX

Interreg North-West Europe BioBase4SME

HEMP IN A BOX

Can Hemp delete the airco?

(And help to stock your wine)

ZERO CARBON

Fase Shift

- How much time does it take before the sun gets through the wall/roof

Hours of fase shift

MOISTRE

- When the moistre is high, it feels like it is warmer.

Hemplime as a regulator of RH

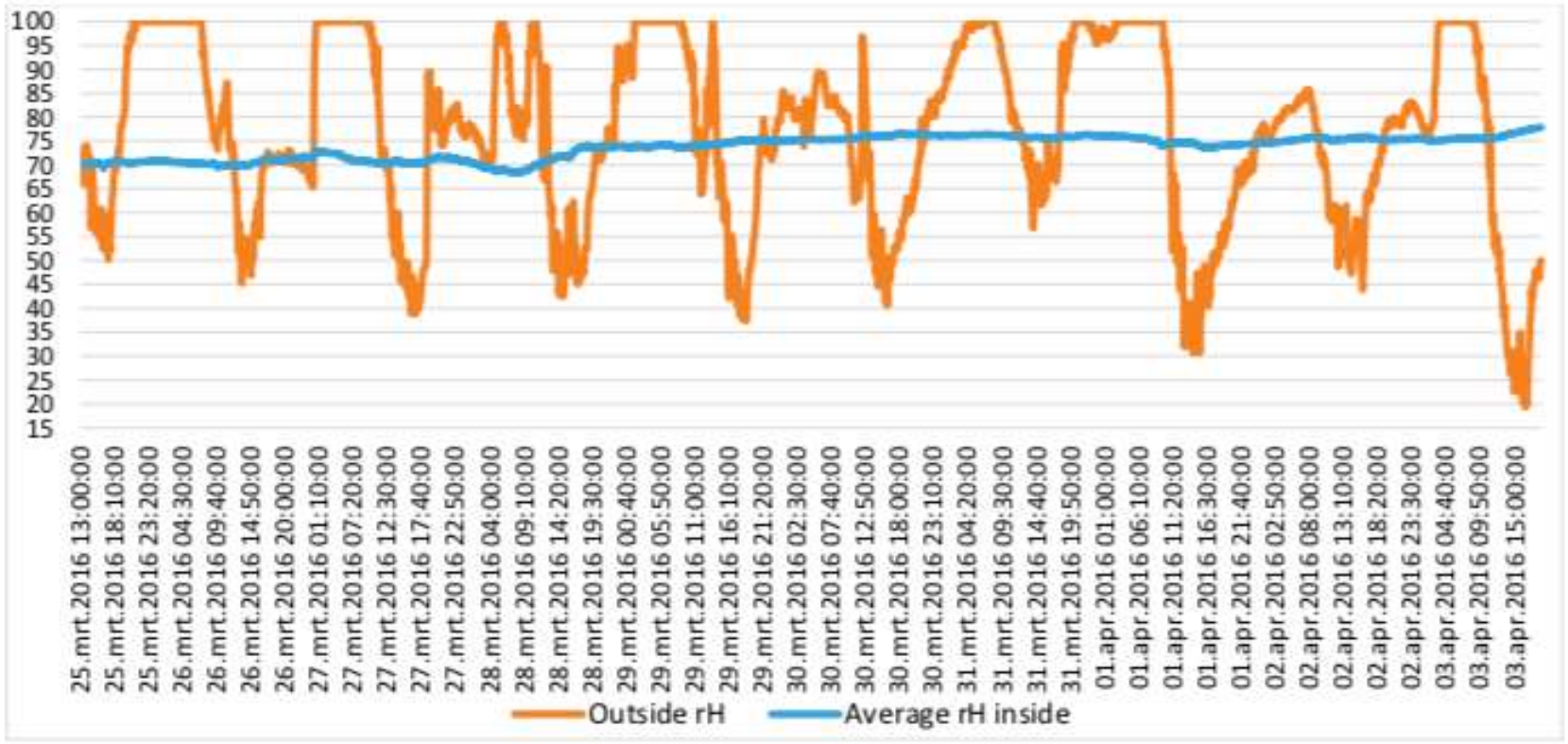


Figure 9: Koele berging: relative humidity distribution - average

HEMP IN A BOX

- Interests?

ZERO CARBON


HEMP
IN A BOX
PROTECTED BY NATURE

NAFIGATE® corporation

Are Circular Economy Hydal PHA technology and products a good business?

Lenka Mynářová
Member of the Board

Key idea of Hydal

Material recovery of WASTE-WCO

Protection of waste watter plant – collection of WCO in household

BIOPOLYMER PHA

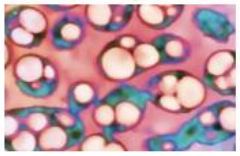
BIOPLASTICS

CHEMICAL SPECIALITIES

Zero Waste manufacturing

"NATURE WORKS"

Biotechnological process



Superbio

Consultation, integration to value chain and sharing the best practices

Hydal is NATURE


WHAT ABOUT
BUSINESS?

Biodiesel or biopolymer from UCO?

PROFIT MARGIN UCOME/ UCO

(UCOME = Used Cooking Oil Methyl Ester)

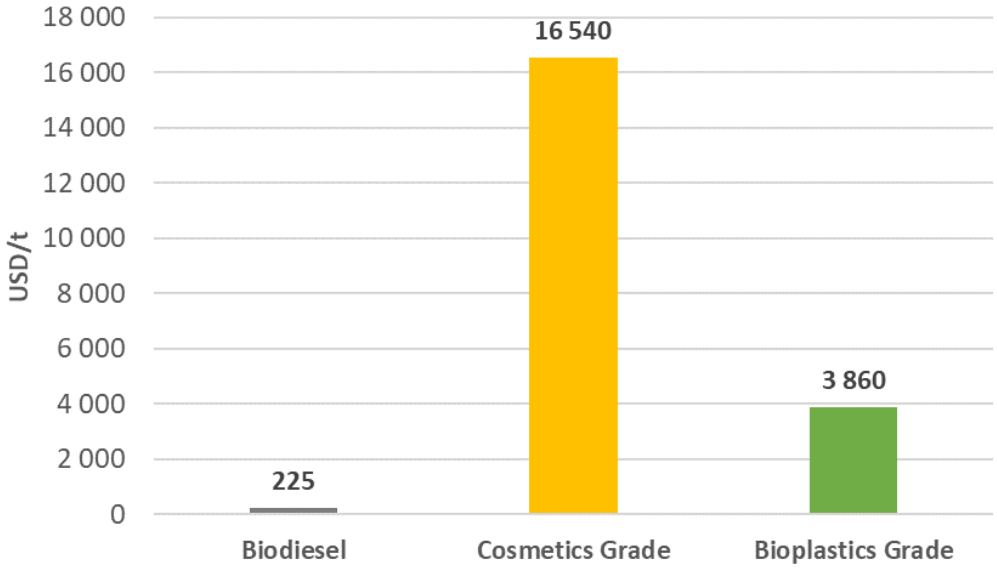
225 USD/t

PROFIT MARGIN HYDAL PHA FROM UCO

(UCO = Used Cooking Oil)

Cosmetics Grade 16 540 USD/t

Bioplastics Grade 3 860 USD/t



Note: UCOME minus UCO according to RED schemes
Source: https://www.greenea.com/en/market-analysis/

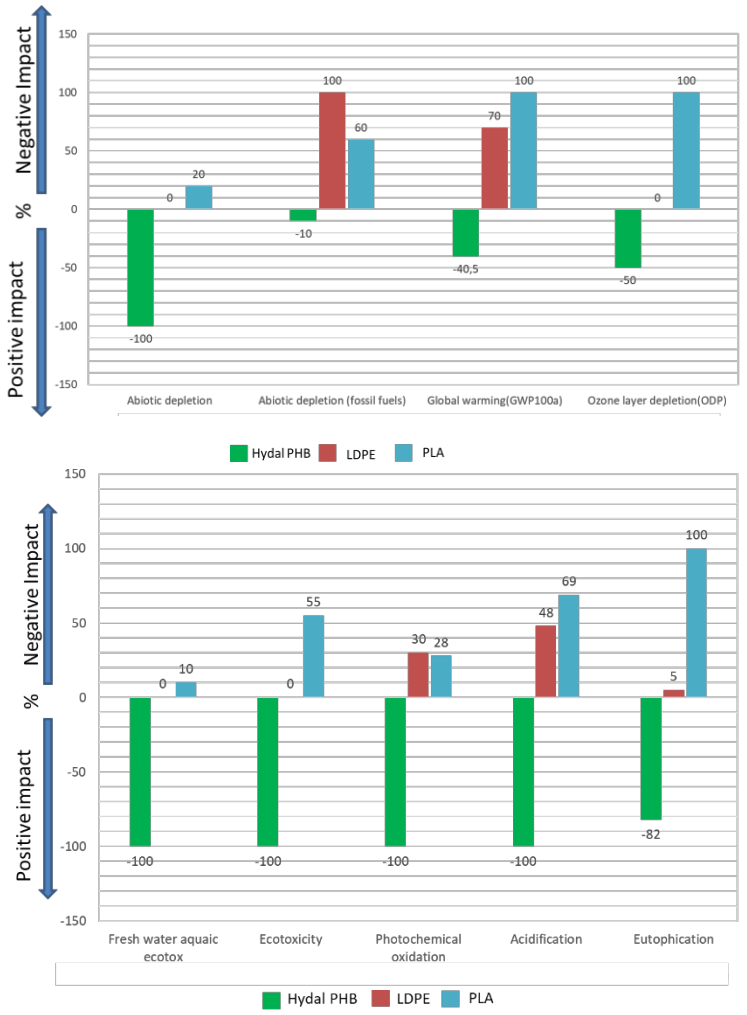
Note: Selling price of Hydal PHA Grades - UCO price/t
Source: NAFIGATE data


AND WHAT
ABOUT NATURE?

Hydal is NATURE

- **The LCA method has shown a significant contribution of the production of PHB (poly-3-R-hydroxybutyrate) polymers from used cooking oil using biotechnology Hydal to environment.**

- **Compared to polymers produced from primary raw materials, biotechnology Hydal saves raw material sources, including oil, reduces CO_2 emissions (so it reduces contribution to global warming), reduces ecotoxicity, freshwater toxicity, acidification, eutrophication (the process of nutrient enrichment, especially by nitrogen and phosphorus, which harm natural environment) and reduces also other negative effects on the environment.**



Thank You

PHARIO ®

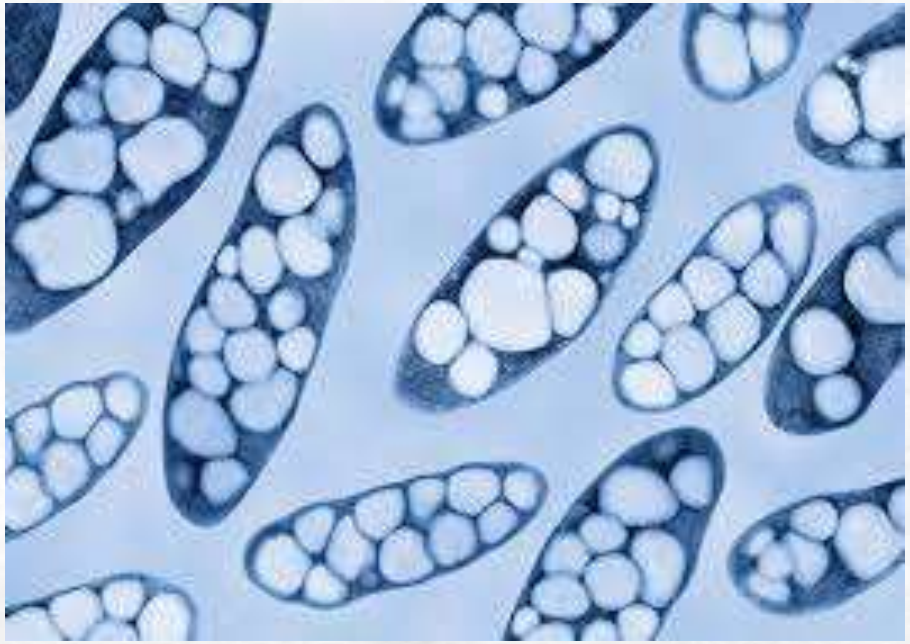
High-quality PHBV from municipal wastewater

from pilot to successful demo: welcome to new applications

Martijn Bovee
Business Developer PHARIO®

www.phario.eu

Biodegradability PHA general



PHA is a unique polymer compared to other biopolymers:
It can degrade to CO2 and H2O (truly) by its nature

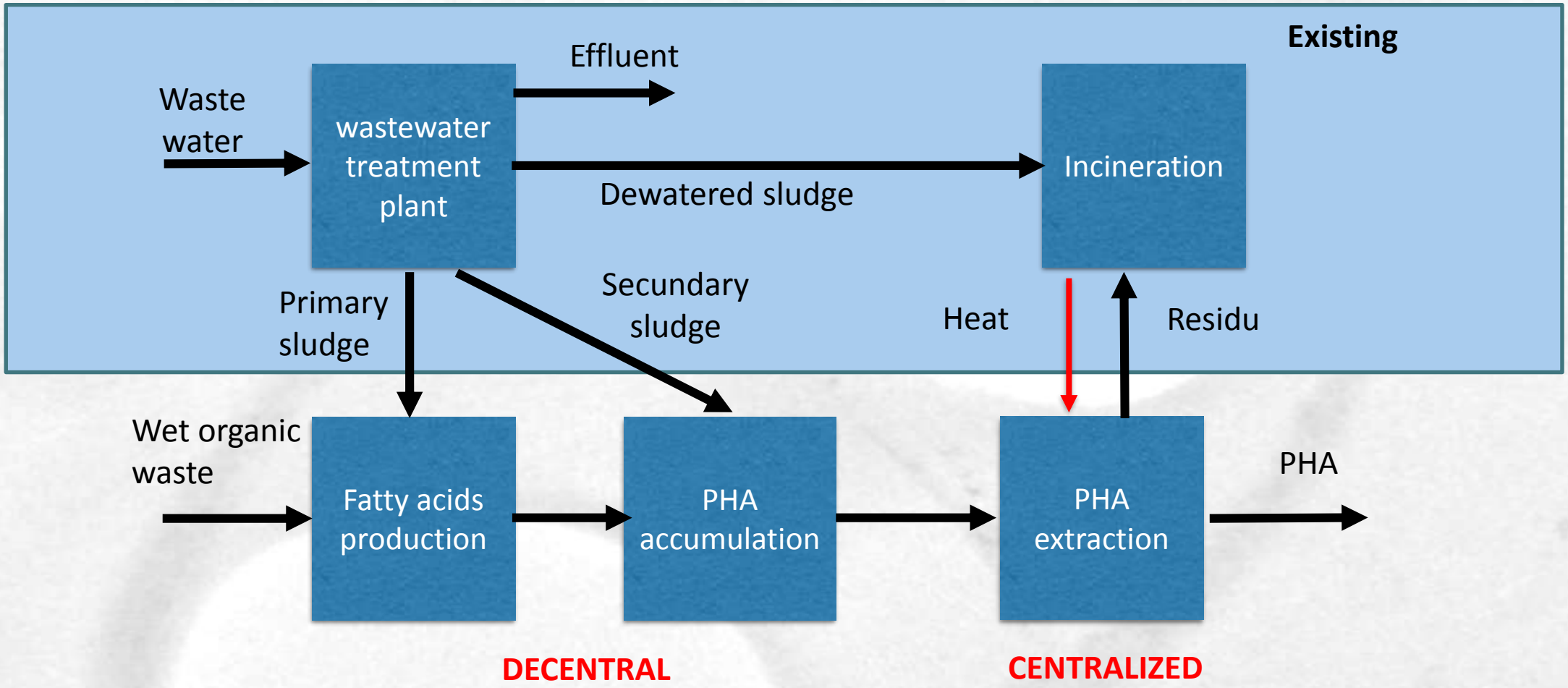
- **In marine environment**
- **In soil environment**
- **In industrial composting**
- **In home composting**
- **Mechanically recyclable**
- **Anaerobic digestion (CH4),or into new PHA**

(will be tested to standards during PHARIO demo stage)

Overview of biobased plastics (thermoplastics)

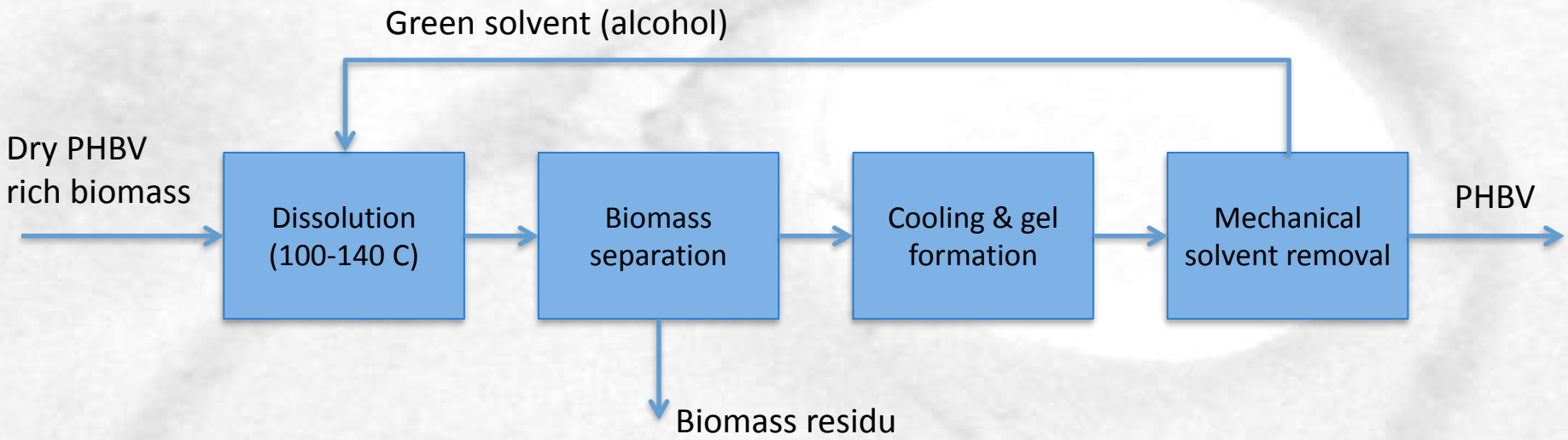
	Non-biodegradable	Biodegradable (in industrial composting installation)	Biodegradable (in water in nature)
On the market today	Bio-PE (drop-in) PA11, PA10.12, PA4.10	PLA (and *PLA/PHA blends*) PHA (and *PHA/TPS blends*)	PHA Regenerated cellulose
Under development (not on the market yet)	PEF Drop ins: Bio-PP , Bio-PVC, Bio-PET, Bio-PTT PBT PA6, PA6.10, PA66, PA12	Bio-PBS Cellulose Acetate PGA *PLA/TPS blends* *Bio-PBS/TPS blends*	

PHARIO®: a new value chain



- Municipal wastewater treatment “trains” bacteria for PHA production
- Added value by harvesting bacteria and use of organic residuals to make PHA bioplastic
- Extraction of the PHA rich biomass with green solvent
- Steerable and high quality PHA polymer

Unique solvent extraction



- **High purity and stable product from heterogenous waste**
- High and tuneable Mw
- Ability to homogeneously blend different HV batches

A scalable process

Pilot (10 month)

- **Biomass WWTP behaves consistent**
- **Feed quality determines PHA quality**
  (so not the influent/biomass)
- **Consistent quality PHA possible**
  (enough control options)
- **Quality PHARIO PHA: good and unique**

Scalability

- **In principle all WWTP's are suitable**
- **Commercial scale: 5000 ton PHA, 800.000 P.E.**
- **Potential Netherlands: 25.000 ton PHA (at least)**
- **Potential EU: 500.000 ton PHA**

Business case

Classic PHA 4-5 €/kg

- Large % of cost related to feed stock
- Volatility in feed costs
- Process relatively mature

PHARIO PHA® 2-3 €/kg 3-4 €/kg

- Feed stock is very cheap
- Long term, stable contracts for feed stock
- Costs based on extrapolation from pilot => much room for optimization

Value case:

- 70% lower than classic PHA production
- Potential to be a climate neutral plastic
- Tertiary feedstock: no food, no GMO

PHA2USE project 2019-2021

Demonstration PHA2USE

- PHA for Application development
- Technology upscaling

Two approaches:

- PHARIO® from sludge
- Paques/TU Delft rich culture

Investing partners

Research & Development

Dordrecht: wwtp & sludge incinerator

350 kg/day PHA rich biomass production

Pilot extraction facility

Extraction 100 kg batches for key application partners

Let’s demonstrate together

PHARIO PHBV capabilities

- Injection moulding, film extrusion: possible
- Other processing: in development
- Bio-degradability as a (controlled) and valued function or end-of-life: water, soil, home, industrial composting, anaerobic digestion
- Datasheet: available (three grades)

Target applications:

- Bio-degradable: For example: seed coatings, fertilizer coatings, horticulture, agriculture, weed protection, plastic bags, packaging (oxygen barrier properties), mulch foils,
- Other applications with added value (impact modifiers PLA and other bio based polymers)

Please share your ideas on application development?!

OPEN SPACE STILL FOR NEW APPLICATION PARTNERS

martijnbovee@efgf.nl

New generation of biomaterials

ADBIOCOMPOSITES

Advanced biomaterials for packaging applications

1. Company presentation

ADBIOCOMPOSITES

- Technological company specialised in developing and commercialising advance biomaterials

- Supported by ITENE (R&D packaging centre)

2. BlockPLA™ grades

Serie	Processing technique
BlockPLA™ E	**Extrusión**
E2410	Alta temperatura de degradación
E2440	Alta propiedad barrera
BlockPLA™ I	**Inyección**
I2410	Alta temperatura de degradación
I2440	Alta propiedad barrera

BlockPLA™ is a recyclable and compostable material (EN 13432-2000) with advanced properties. BlockPLA™ is based on PLA and can be supplied as masterbatch or ready to use pellet to be processed by the conventional processing techniques (Extrusion, injection, etc.)

ADBIOCOMPOSITES
Advanced biomaterials for packaging applications

3. Benefits of using BlockPLA™

TECHNICAL PROPERTIES

High barrier (OTR/ WVTR)
Thermal stability and improved mechanical properties
Transparent

INDUSTRIAL PRODUCTION

Supplied as masterbatch, additive, or ready to use pellet
Processed by conventional processing techniques

FOOD CONTACT SAFETY

Block PLA does not contain nanoparticles
Food contact approved

LIFE CYCLE

BlockPLA is biodegradable and Compostable
EN 13432-200

ADBIOCOMPOSITES
Advanced biomaterials for packaging applications

4. Applications of BlockPLA™

ADBIOCOMPOSITES
Advanced biomaterials for packaging applications

We can Taylor our BlockPLA™ grades to your technical requirements

LET US KNOW YOUR APPLICATION!

www.adbiocomposites.com
Parque Tecnológico de Paterna
C/ Albert Einstein 5, Valencia
+34 672 387 098
j.martin@adbiocomposites.com

ADBIOCOMPOSITES
Advanced biomaterials for packaging applications

UNIVERSITY OF WESTMINSTER

BIOPLASTICS FOR MEDICAL APPLICATIONS

Cristina Pérez-Rivero

Applied Biotechnology (Prof. Ipsita Roy)

perezrc@westminster.ac.uk

I.Roy01@westminster.ac.uk

What we do

Bio-sourced polymers

- **Polyhydroxyalkanoates (PHAs)**
- Bacterial cellulose
- Y-Glutamic acid

High performance materials

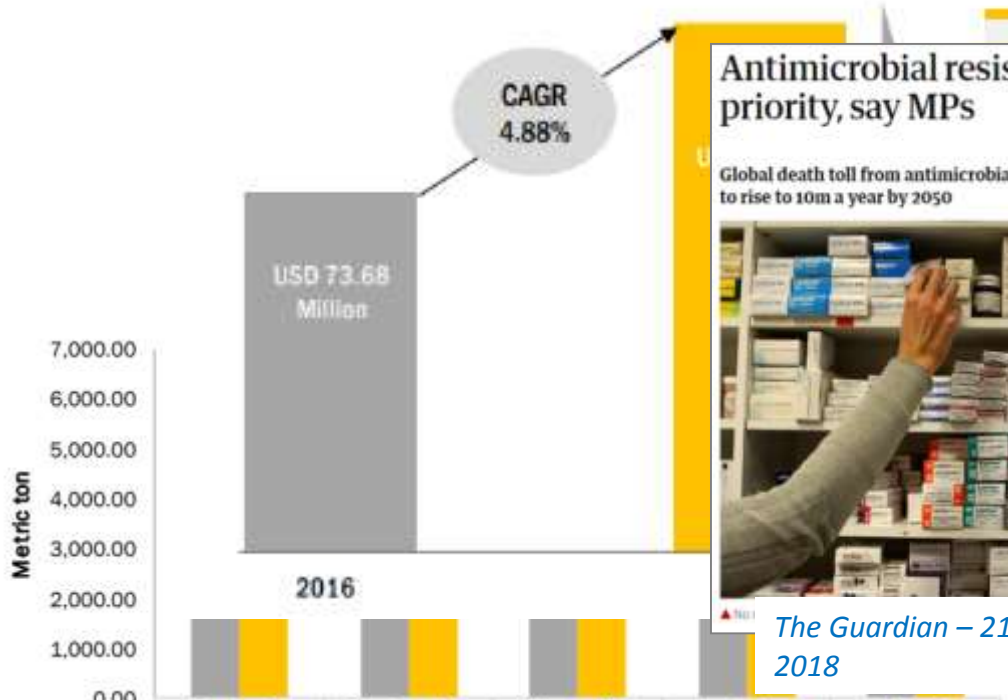
- Highly **biocompatible**
- **Tailor-made:** properties adjusted to meet product requirements

Biodegradable

- in **human body, soil** and **marine environments**

Growth of PHAs market

Stents : *projected to reach USD 1,786.6 million by 2021 from USD*



	Packaging	Food services	Bio medical	Agriculture	Others*
2016	4,711.25	4,359.15	3,136.18	1,791.81	1,296.46
2021	6,501.04	5,923.91	4,257.84	2,412.27	1,639.59
CAGR (2016-2021)	6.65%	6.38%	6.31%	6.13%	4.61%


Antimicrobial resistance must be policy priority, say MPs

Global death toll from antimicrobial-resistant infections expected to rise to 10m a year by 2050

OPPORTUNITIES

The Guardian – 21 October 2018

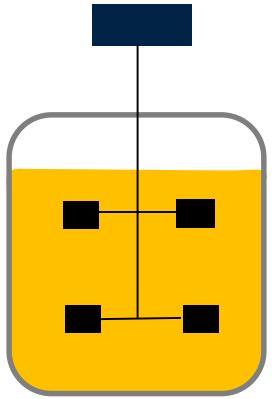

Microplastics found in human stools for the first time

Study suggests the tiny particles may be widespread in the human food chain

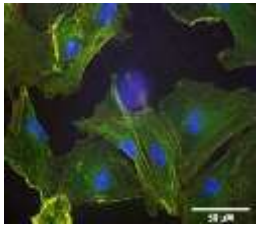
The Guardian – 22 October 2018

Fermentation technology

Nutrients + Bacteria



Cell culture



Characterization & processing

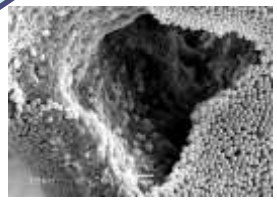
Solvent casting | Deep moulding | Electro-spinning | 3D printing

Prototype desing

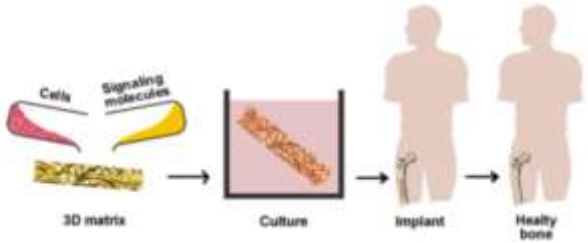
Nerve conduits

Stents

Antimicrobial coatings/ scaffolds



Microspheres



Tissue engineering

THE TEAM

Scientific Advisor

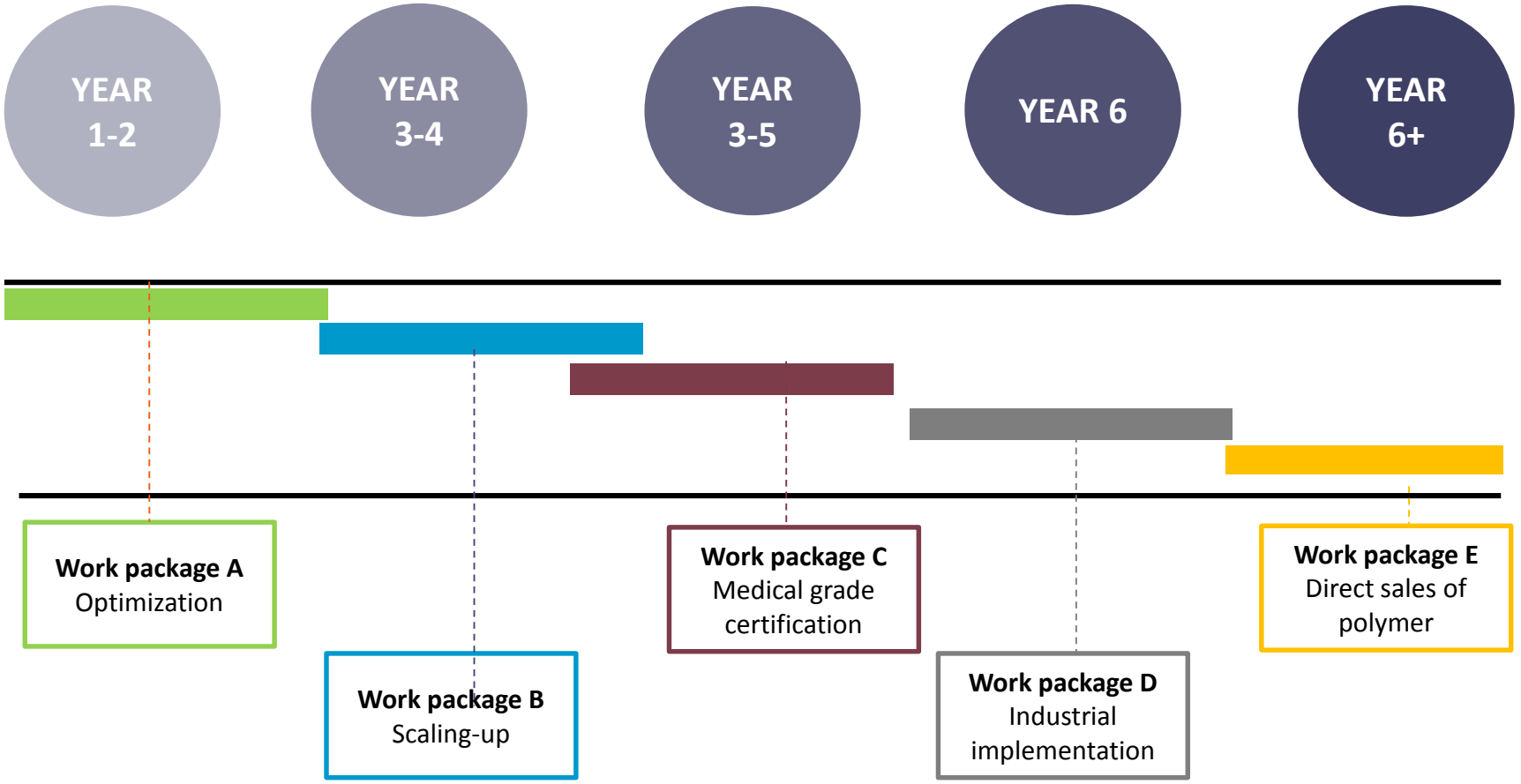
- detailed design of technical work-plan and guidance

Biochemical Engineer

- development and optimization of the production process

Polymer Scientist

- downstream, purification & functionalization


YEAR 1-2
YEAR 3-4
YEAR 3-5
YEAR 6
YEAR 6+
Work package A Optimization
Work package B Scaling-up
Work package C Medical grade certification
Work package D Industrial implementation
Work package E Direct sales of polymer

Roadmap

British Heart Foundation

Imperial College London

SEVENTH FRAMEWORK PROGRAMME

Thank you for your attention!

EPSRC
Pioneering research and skills

POLYBIOSKIN

HyMedPoly

NEURIMP

ReBioStent
Reinforced Bioresorbable Biomaterials for Therapeutic Drug Eluting Stents

BioComposites Centre

Pilot Scale Equipment at the BioComposites Centre

Bangor, Wales, UK

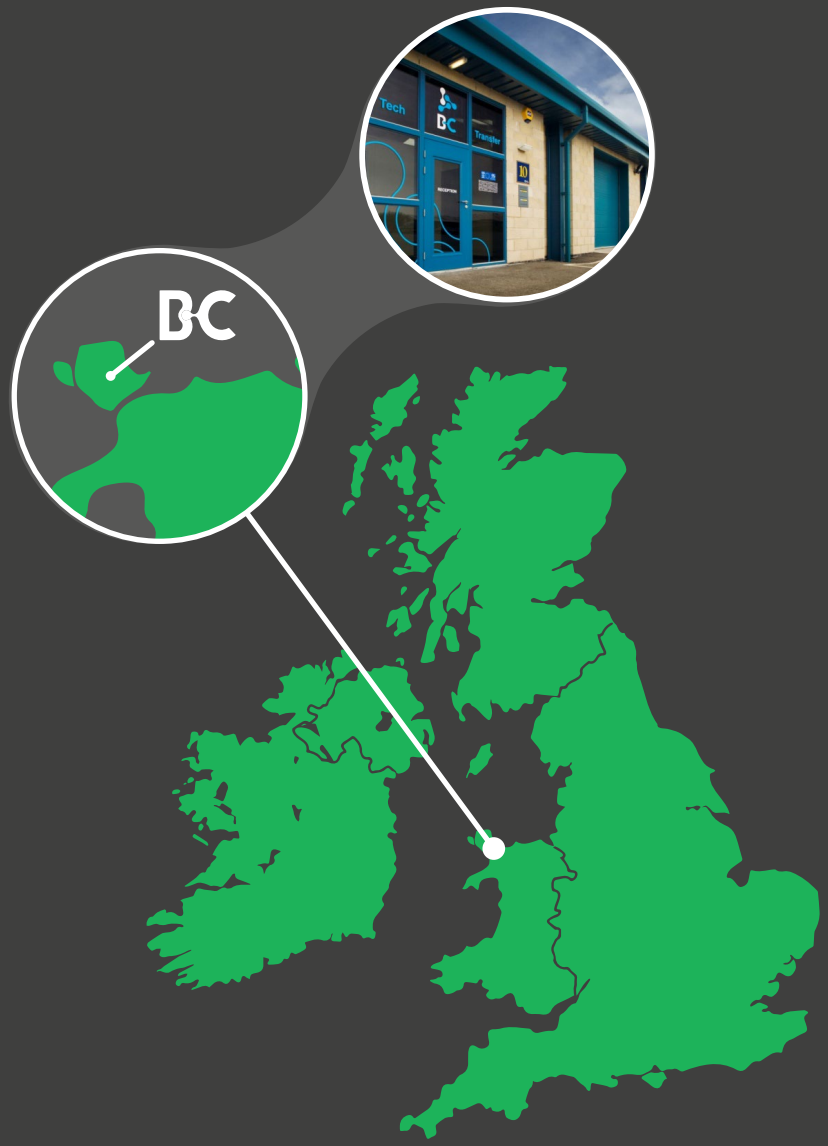
Dr. Adam Charlton
adam.charlton@bangor.ac.uk
bc.bangor.ac.uk
00 44 1248 388072

Pitch perfect and boost the European bio-economy event

7 November 2018 Brussels Airport

BioComposites Centre

BC



INNOVATION IN **BIO-MATERIALS FOR INDUSTRY**

- **Established in 1989, self financing and focused on collaboration with industry (publicly funded R&D projects and commercial contracts)**
- **Demonstration of a range of biomass processing, extraction and conversion technologies up to TRL4**
- **Extensive experience processing a range of agri-food- forestry residues**

BioComposites Centre

BC

RESEARCH AREAS

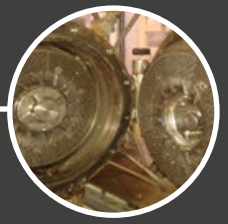
BIOMASS

Mycology - application of fungi as biological pre-treatment

Enzymatic fractionation (functional food ingredients)

Plant Extracts (cosmetics, personal care, medical sectors)

Bio-based polymers & fibre (food packaging)



Pre-treatment physical and chemical

Life Cycle Assessment

Bio-Composite Materials & Bio-resins (construction)

BioComposites Centre

BC

DRY BIOMASS PRE-PROCESSING

Chipping, chopping, sieving & fibre drying

Atmospheric & continuous pressurised disc refining

BioComposites Centre

BC

WET BIOMASS PROCESSING

Dewatering

Heated, stirred tanks

Physical separation

Wet milling

Ultrafiltration

Spray drying

BioComposites Centre

BIOBASED PRODUCT DEVELOPMENT

Fibre based packaging

Bioplastics
Wood plastic composites

Biocomposite panels

Plant extracts

Your multi-skilled scientific and technical partner

Expertise – Quality – Speed – Confidentiality

CELABOR: Walloon technological pilot platform for biomass refining and downstream processing

Dr. Mahmoud Hamzaoui

Pitch perfect and boost the European bio-economy event, 7 November 2018, Brussels Airport

CELABOR: Five departments in the heart of the "Bioeconomy" sectors

CELABOR scrl. is a Belgian scientific and technical center based in the Petit-Rechain industrial park near Verviers. CELABOR is offering scientific and technical support to companies involved in all sectors of **circular-economy** and **bioeconomy** including agrifood, green processes, packaging, textile and environment.

Textile

Nutrition

Environment

Extraction

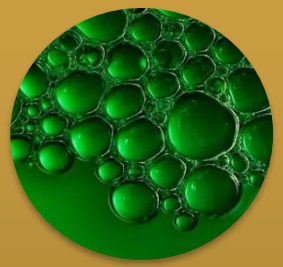
Packaging

"Extraction" & "Sustainable Materials – Packaging" departments

Green extraction & purification technologies

Bio-based lignocellulosic resources valorisation

Novel & low cost process: Nanocellulose production & surface functionalisation



Algae and microalgae green refining & purification

Microbial products & building-blocs recovery

Pre-treatment and extraction of raw material

Fractionation and Purification

Post-treatment, concentration, drying

Characterization and quantification

Qualification and stability study

Technological pilot platform (350 m²)

Two pilot plants **Supercritical Fluid Extractors SFE-CO2** (2x 6L/batch)

Pilot-scale **Subcritical Water Extraction (SWE)** (6L/batch)

Conventional **solvent extraction** (25L and 400L)

Pilot-scale **Pulsed Electric Field** (Solid: 0,5 kg/batch; liquid: 350L/batch)

Ultrasounds & Microwave assisted extraction (25L UAE/ 5L MAE)

High Pressure Homogenisation for NFC processing

Pilot-scale **post-treatment equipment** (Freeze-dryer, Spray-dryer, Evaporator, Centrifuge)

Purification platform (CPC, MPLC, Prep-HPLC)

Advanced **analytical lab** (UPLC-MS, GC-MS, ICP-MS, HPLC-DAD-ELSD

RESEARCH PROGRAM & COLLABORATIVE PROJECTS

The main mission of Celabor is to encourage technological innovation and the development of new products or processes through research and development. Celabor conducts private development and research on behalf of companies and also participates in research and development programs financed by Europe and the Regions.

2016 & 2017

BARBARA
AFTERLIFE
PROLIFIC
EXCORNSEED

HORIZON 2020
As an SME

FEDER
Wallonie

BIO-BASED INDUSTRIES
Public-Private Partnership
Bio-based Industries Consortium
Celabor Full BIC member

cornet
As an RTO

IraSME
As an RTO

Interreg
North-West Europe

Interreg
France-Wallonie-Vlaanderen

Interreg
Grande Région / Großregion

THANK YOU

Dr. Mahmoud Hamzaoui
Food Technologies – Extraction Department
Mahmoud.hamzaoui@celabor.be

Follow us:

Visite us:

Reduce time-to-market for bio-based products

High throughput methodologies for bio-based materials R&D

flamac
a division of SIM

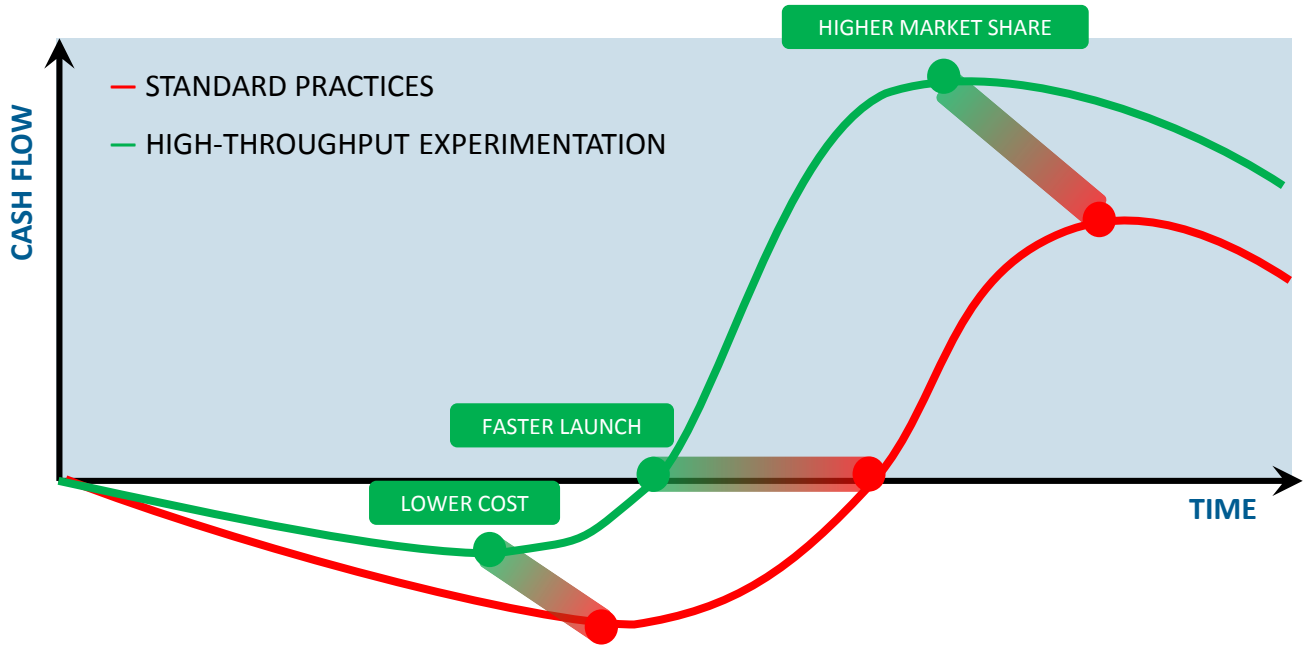
michele.kint@flamac.be

flamac
a division of SIM

Challenge : Time-to-market critical for innovative materials

- Solution : High throughput methodologies
  - Faster : more samples in less time
  - Smaller sample sizes : less material consuming
  - Broaden research : more samples so more data available for research

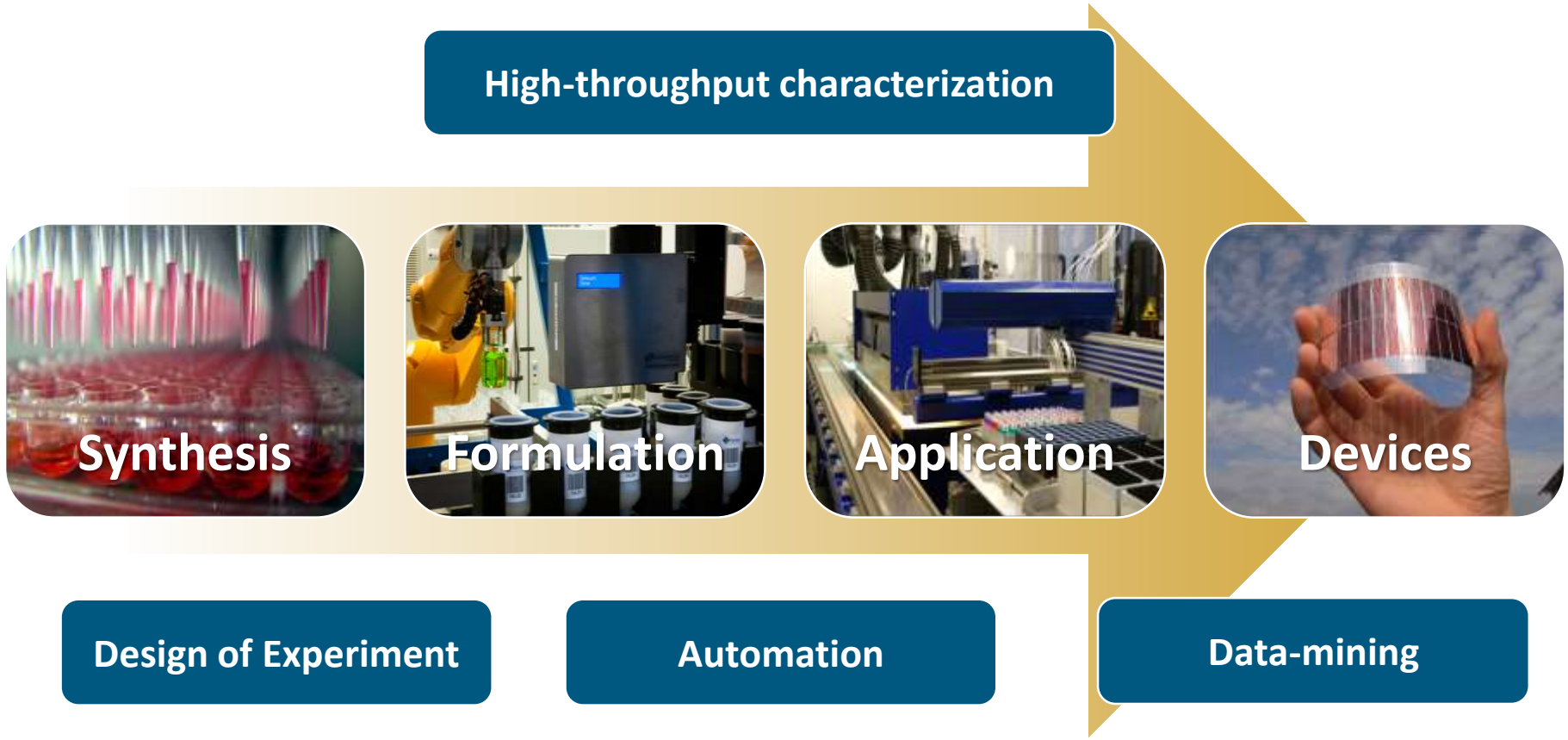
- Competitive advantage :



flamac
a division of SIM

FLAMAC - High throughput technologies

- Entire Value Chain : from synthesis to the final product



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a division of SIM

Recent Launch of Automated Stability Platform

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a division of SIM

Looking forward to collaborate !

E.g. Collaboration Applisurf : UGent, BBEPP,… & Industrial partners in field of ‘Bio-surfactants’

Inks, paints & coatings

Polymers

Consumer goods

Cosmetics

Alloys & ceramic materials

Solar cell materials

Micro – capsules

Food

And many more …

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