

Excellence in Plastics



Mar 2024



# What is AIMPLAS?

A **technology centre** with more than 30 years' experience in the plastic sector.





Add value to companies to generate **wealth** and create **employment**.



Add value to society to improve quality of life and ensure environmental sustainability.

# Our Mission





More than **12,000 m<sup>2</sup>**  
of cutting-edge  
facilities

Pilot plants (6,500 m<sup>2</sup>)

Laboratories (4,500 m<sup>2</sup>)

Training (1,000 m<sup>2</sup>)





EUR **21.3M**

revenue



**3,300+**

clients

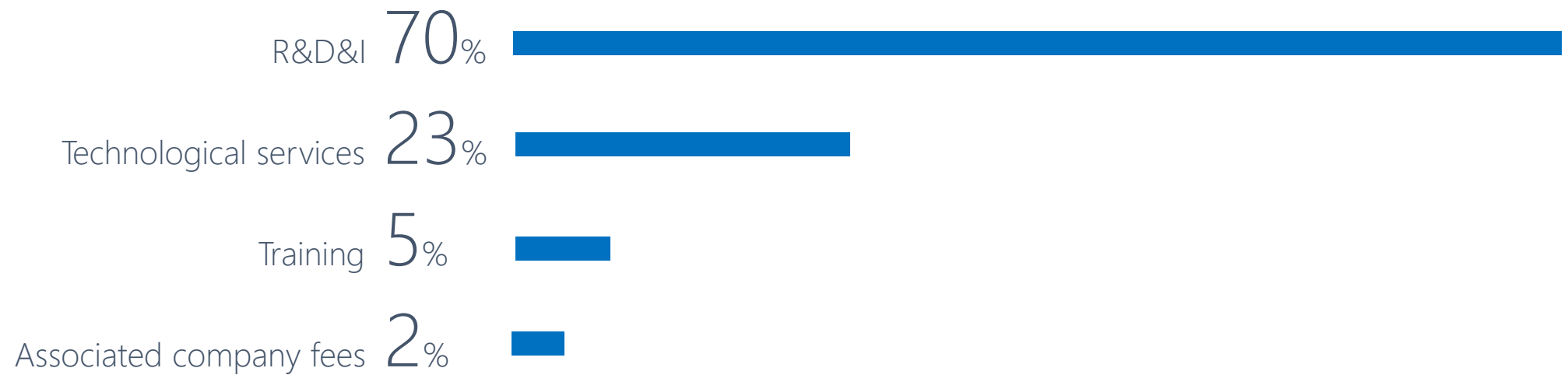


**840+**

member  
companies

2023 DATA

# Revenue by Activity



2023 DATA

# Market Orientation



Packaging



Construction



Automotive and transport



Recycling



Printing



Aeronautics



Agriculture



Electrical and Electronics



Energy



Health



Navigation



Aerospace

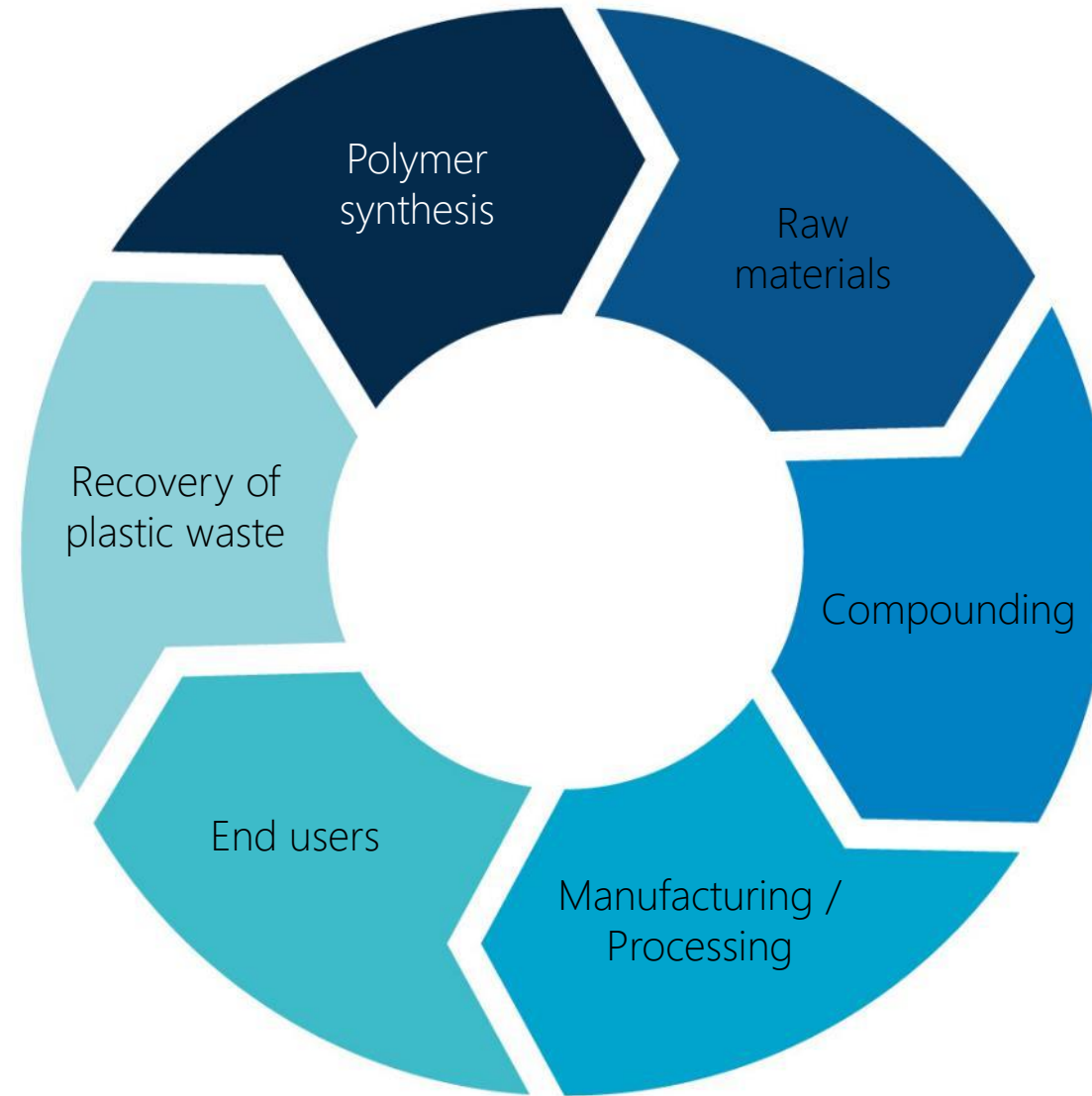


Furniture



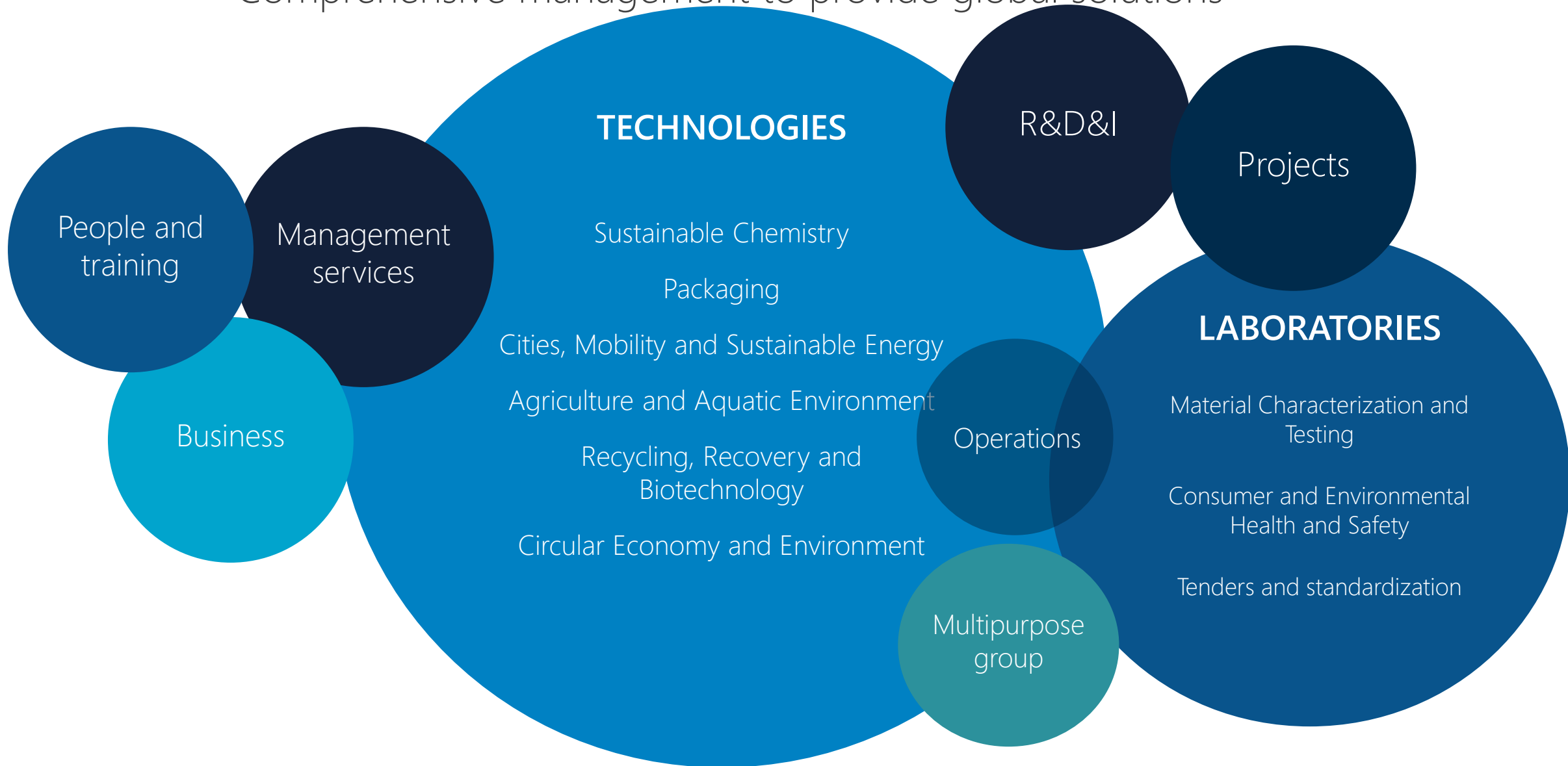
Sports and Leisure

Expertise across  
the entire plastics  
value chain





# Comprehensive management to provide global solutions





# R&D&I Projects

Innovative solutions accessible to companies

279

R&D&I projects

85

international

194

national

532

companies

401

SMEs

2023 DATA

Return of over **€73.6** million to companies



# We work with industry leaders





# Synthesis Group





# Synthesis Team

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# Research Lines

## Expertise in:

### Synthesis & Upcycling of Monomers, Oligomers, Polymers



**Biomass  
Valorization**



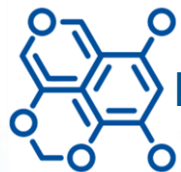
**Tailored  
Synthesis**



**Up scaling**



**Chemical  
Recycling**



**Enhanced  
Performance  
Polymers**

### Synthesis & Preparation of Plastic Additives and Materials



**Encapsulation  
Processes**



**Cosmetic  
Products**



**Healthcare  
Solutions**



**Purification  
& Extraction  
Processes**



**Sustainable  
Flame Retardants**



**Polymer  
Markers**

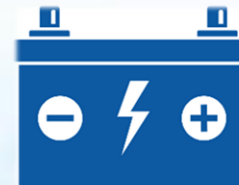
### New developments topics:



**Space  
Applications**



**Adhesives**



**Batteries  
Additives**





## RENEWABLE SOURCES- WASTE & BIOMASS VALORISATION



### BIO-BASED POLYMERS

#### THERMOPLASTIC BIOPOLYMERS

PLA

PBSA

PEF

TPU

PET

PBS

PAs

#### THERMOSTABLE BIOPOLYMERS

PUR

POLYOL-POLYETHER

POLYOL-POLYESTER

NIPU

BIOEPOXY

ACRYLIC

BENZOOXAZINE

BIOUPE



### NATURAL

POLYSACCHARIDES

VEGETAL OILS

LIGNIN

STARCH

CELLULOSE

CHITIN &  
CHITOSAN

ALGINATE

PECTINE



### MICROORGANISMS SYNTHESIZED POLYMERS

PHAs

PHB

PHBV

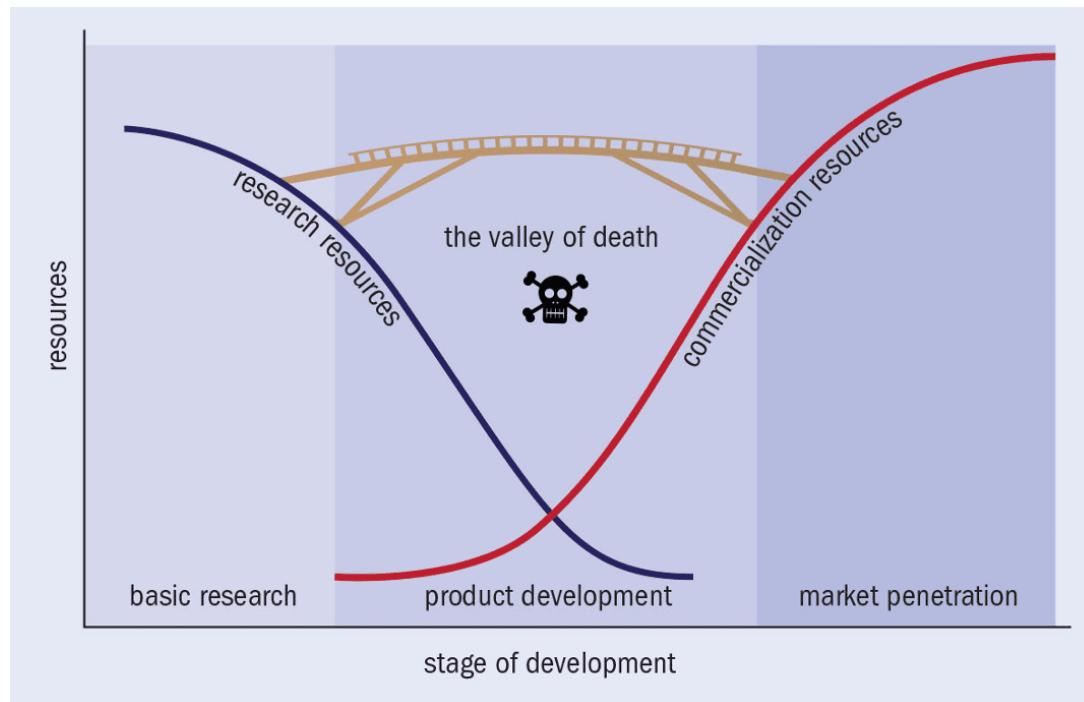




## Scale up Development

*from lab to pilot plant  
from grams up to 100 kg*

- Polycondensation Reactions
- Transesterification
- Ring opening (co-)polymerization
- Polyaddition
- Enzymatic polymerization
- Solid State Polymerization



**Polyesters  
Polyamides  
Polyuretanes  
Etc.**

**Steel  
Reactors  
up to 100 L  
up to 300 °C  
60 bars**

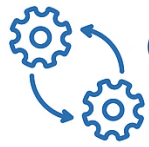
**Discharge  
lines for  
pelletization  
up to 6 kg/h**

**Glass  
Reactors  
up to 200L  
up to 250 °C**



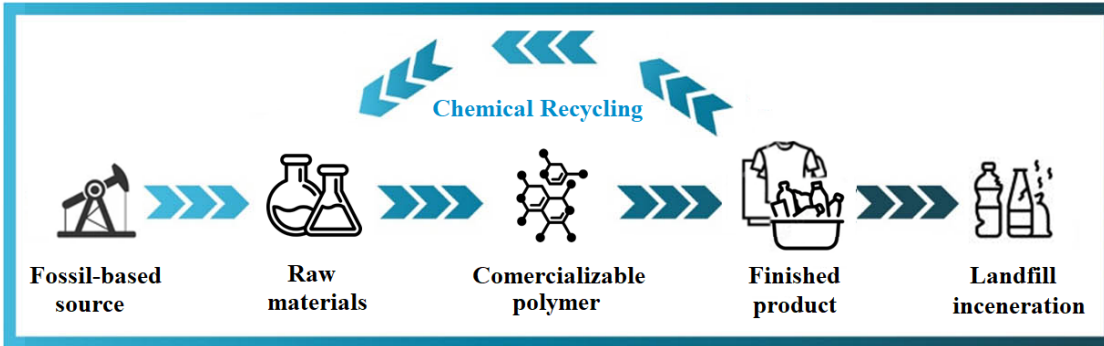


# Expertise in Polymer Synthesis & Modification



## Chemical Recycling

### Processes of plastic depolymerization and repolymerization



### Depolymerization

### Repolymerization



By Solvolysis:

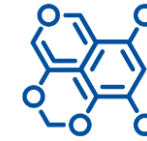
- Methanolysis
- Glycolysis
- Hydrolysis

In supercritical or subcritical conditions



Expertise in repolymerization and scale up of:

- PET ( $IV \leq 0,65$ )
- PET ( $IV \geq 0,75$ )
- TPU



## Enhanced Performance Polymers

### Synthesis and scale up process for:

- Synthesis of tailor-made monomers
- Polymers with enhanced **biodegradability**
- Polymers and resins with increased **biocontent**
- Polymers and resins with increased **recycled content**



Bio-polyester (40%)



Bio-UPER (25%)



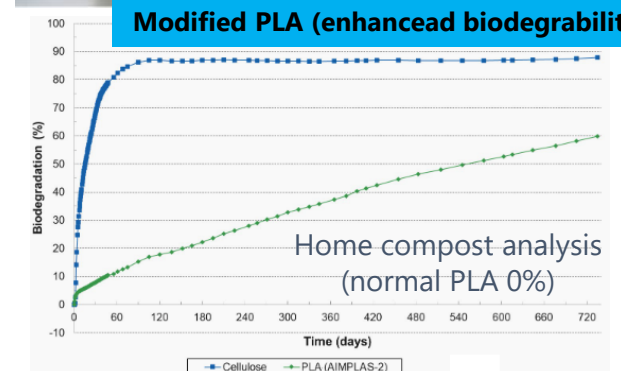
Bio-Epoxy (70%)



r-PET (100%)



Modified PLA (enhanced biodegradability)



Analysis and certification by:





## Healthcare Solutions

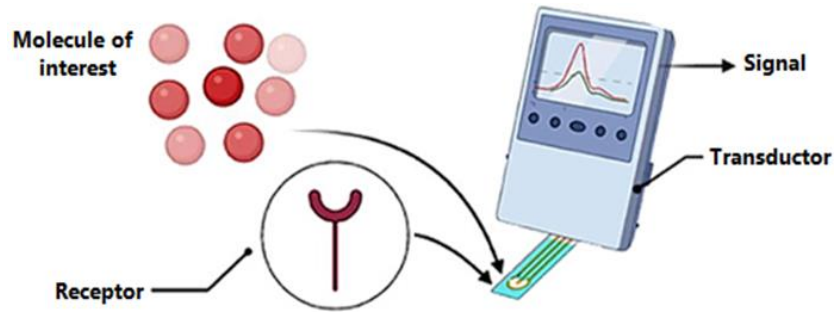
- **Preparation of Sensor Devices**

**Type:**

- Electrochemicals
- Optical
- Thermal

**Application:**

- Pathogen
- Sweat
- Drugs, etc.



## Sensor Technologies



## Antimicrobial Solutions

- **Preparation antimicrobial additives with antimicrobial activity** (bacteria and/or fungi)
- **Inclusion of additives in polymeric matrices** (thermoplastics, thermosets, coatings)

Analysis and certification by:



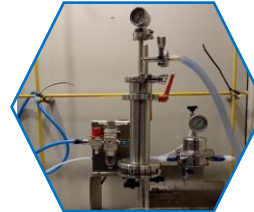
ISO 22196 | JIS Z2801  
ISO 21702:2019



ISO 20743:2013  
ISO 18184 | UNE EN 11476



## Purification & Extraction Processes



Scale up from mL to L by different techniques:

- **Ultra-filtration**
- **Liquid/liquid extraction**
- **Solid/liquid extraction**
- **Fractional distillation**
- **Chromatography**
- **Precipitation & Crystallization**
- **Centrifugation**

Evaluation of purity by:

- **Gas chromatography** (GC)
- **Liquid chromatography** (HPLC)
- **Magnetic Resonance** (NMR)



## Purification Processes



## Extraction Processes

**Recovery of High-value products from biomass:**

- **Chitosan** (insects & shrimps)
- **Monomers for polymerization** (diacids, dioles, etc)
- **Bio-based additives** (i.e. antiox or antimicrobial activity)



## Encapsulation Processes



## Cosmetic Products

### Preparation process and Scale up of Nano- & Micro-capsules:

#### Capsules:

- Silicas
- Bio-based PLA
- Bio-based polysaccharides
- Bio-based Hydrids (Si-C)
- Metal Organic Frameworks (MOFs)
- Porous Nano- & Micro-particles

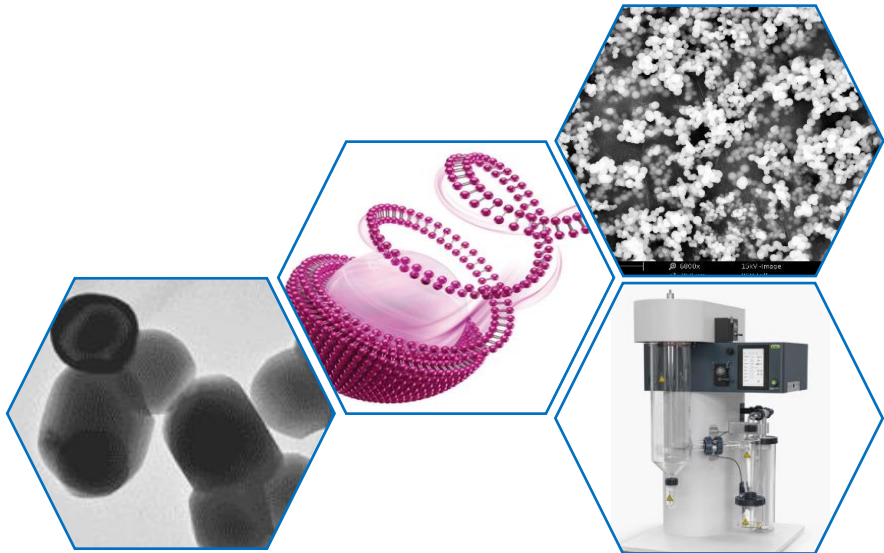
#### Technologies:

- Spray dryer
- Sol-gel
- Micro- & Nano-emulsions (Pickering)
- Interfacial polymerization
- Sacrificial template Coating
- Mechanochemistry
- Liposomes



### Target Market

- **Cosmetic**  
anti-ox, anti-age
- **Antimicrobial**  
bacteria, fungi
- **Agriculture**  
fertilizers & antiplague
- **Fragrancy**  
aromas and perfumes
- **Packaging**  
preservatives and ingredients
- **Industry**  
pest control (anti-mite)



PP & PS with anti-mite Silicas



**AIMPLAS**  
INSTITUTO TECNOLÓGICO  
DEL PLÁSTICO







## Sustainable Flame Retardants

- Intrinsically Flame retarded polymers and resins
- Sustainable Flame retardants additives
- Biobased flame retardants
- Optimization and scale up for FR inclusion processes in polymeric matrices



Analysis by:

**Cone Calorimeter (ISO-5660)**  
**UL-94**  
**LOI**  
**TGA**



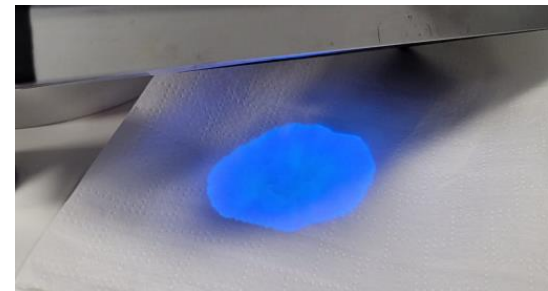
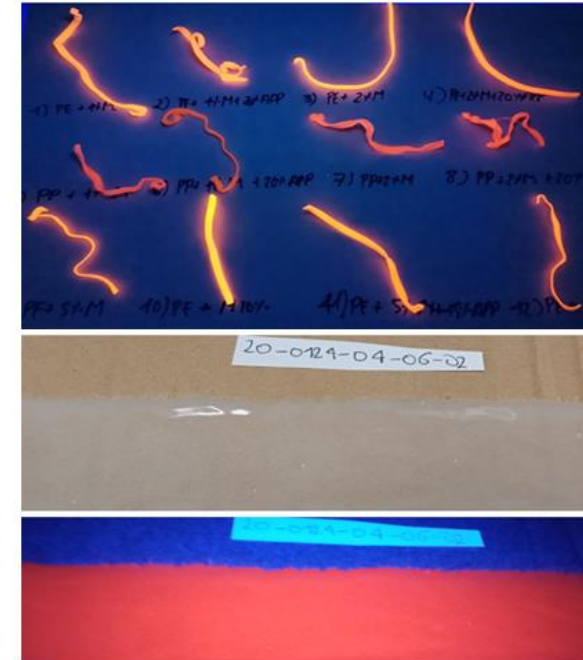
- **WO2023/094526**  
(Sustainable DOPO FR synthetic route)
- **EP21383062.3**  
(Phosphorous Bio-based FR)



## Polymer Markers

### Synthesis and scale up for:

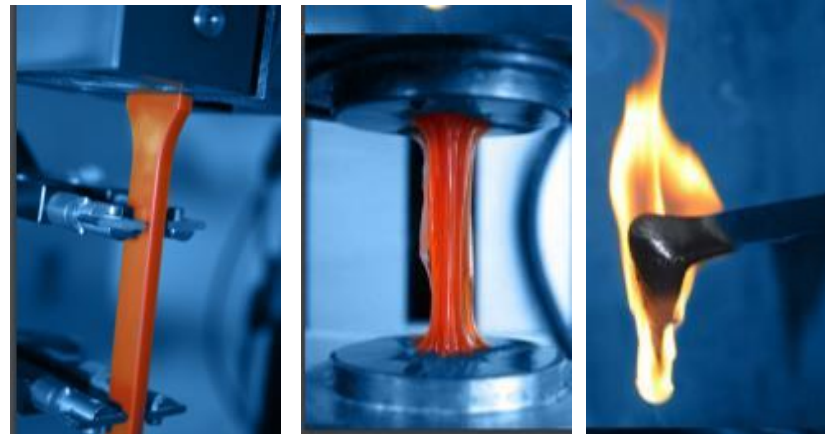
- **Fotoluminescent additives of block d** (red light)
- **Bio-based fotoluminescents** (blue light)
- **Isotopically modified materials** (IR detection)
- **Marked technologies** (Nuclear Magnetic Resonance)



- **EP 3 587 482 A1**  
(Isotopically labelled materials for degradation detection)

# Analysis and Testing

- Electronic microscopy: SEM, TEM, AFM
- Optical microscopy
- FTIR, RAMAN Spectroscopy
- Thermal characterization: TGA, DSC, HDT
- Mechanical characterization: impact, compression, bending, tensile properties
- Electrical and thermal conductivity
- Dynamic rheometry analysis
- Dynamic-mechanical analysis
- Fire behaviour
- ...



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INNOVATION NETWORK

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