

CBE JU Info Day in Portugal

Towards national successes in the 2024 call:
information & technical visit

Luis P. Fonseca, successful Coordinator of the **POLYMERS-5B** project submitted to the call

Horizon-JU-CBE-2023-R-04, Development of novel, high-performance bio-based polymers and copolymers

luis.fonseca@tecnico.ulisboa.pt

Phone: 218419139

Instituto Superior Técnico – Lisbon University, Lisbon, Portugal
Department of BioEngineering - DBE

Institute for Bioengineering and Biosciences – iBB (<https://ibb.tecnico.ulisboa.pt/>)

BIOCATALYSIS and BIOTRANSFORMATION RESEARCH GROUP - 

Background of the POLYMERS-5B project

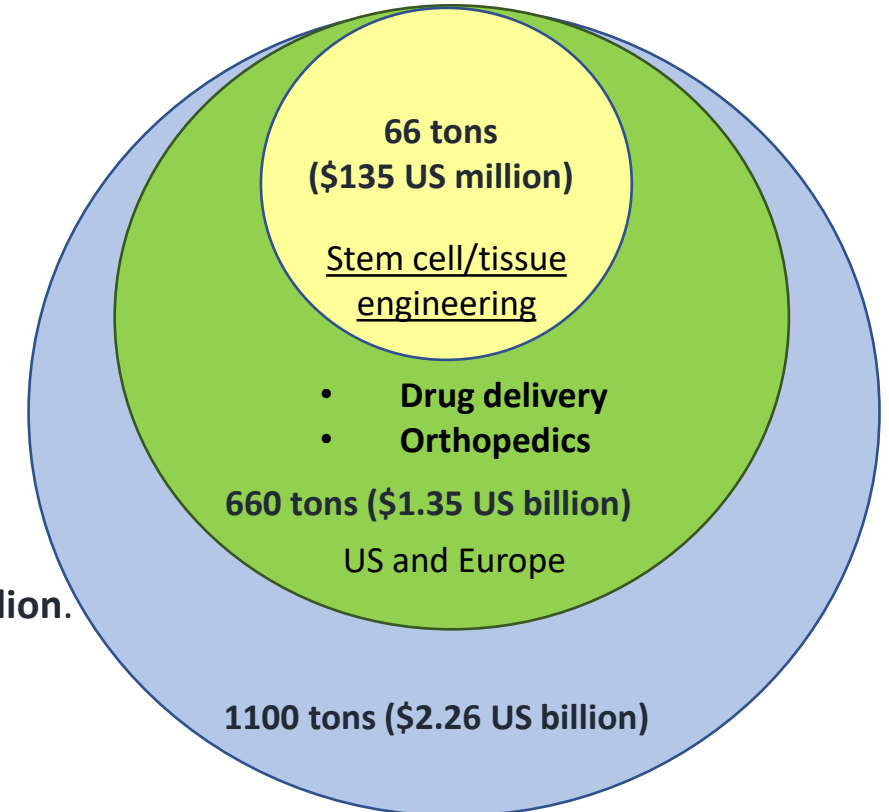
- . Synthesis of polyesters via Biocatalysis in aqueous and miniemulsion systems at IST (2017)
- . Patented Polymers-5B technology (2019).

Participation in HiSeedTec Program – Innovating from Science (2018)

PLASTICS-4B - Upgrading Biomedical Devices for Better Health

Plastic -4B competing biodegradable polymers for biomedical applications

Product features / Customer benefits	Poly-lactic acid	Poly-glycolic acid	Poly-caprolactone	Plastics-4B
Cell viability / Tissue quality	++	+ (more acidity)	+++	+++
Cell replication / Faster growth	++	++	+ (less cell adhesion)	+++
Melting point / Ease of molding	++ (150°C)	+ (225°C)	+++ (60°C)	+++ (70°C)
Time to degrade	1-2 years	2-3 months	3-4 years	2-3 months



MARKET- Biodegradable polymers for biomedical applications **298 tons** and **\$590 US million**.



Sources: Grandview Research (2016), Bioresorbable Polymer Market.

Plastics-4B - Pipeline

Orthopedics

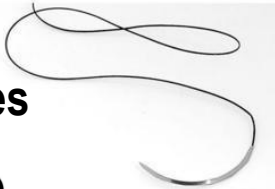
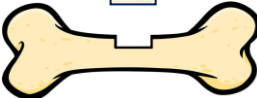
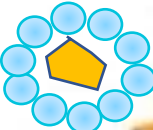
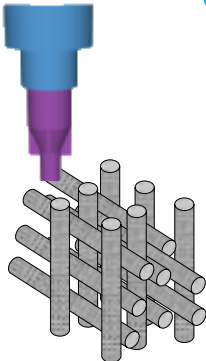
Sutures

Meshes

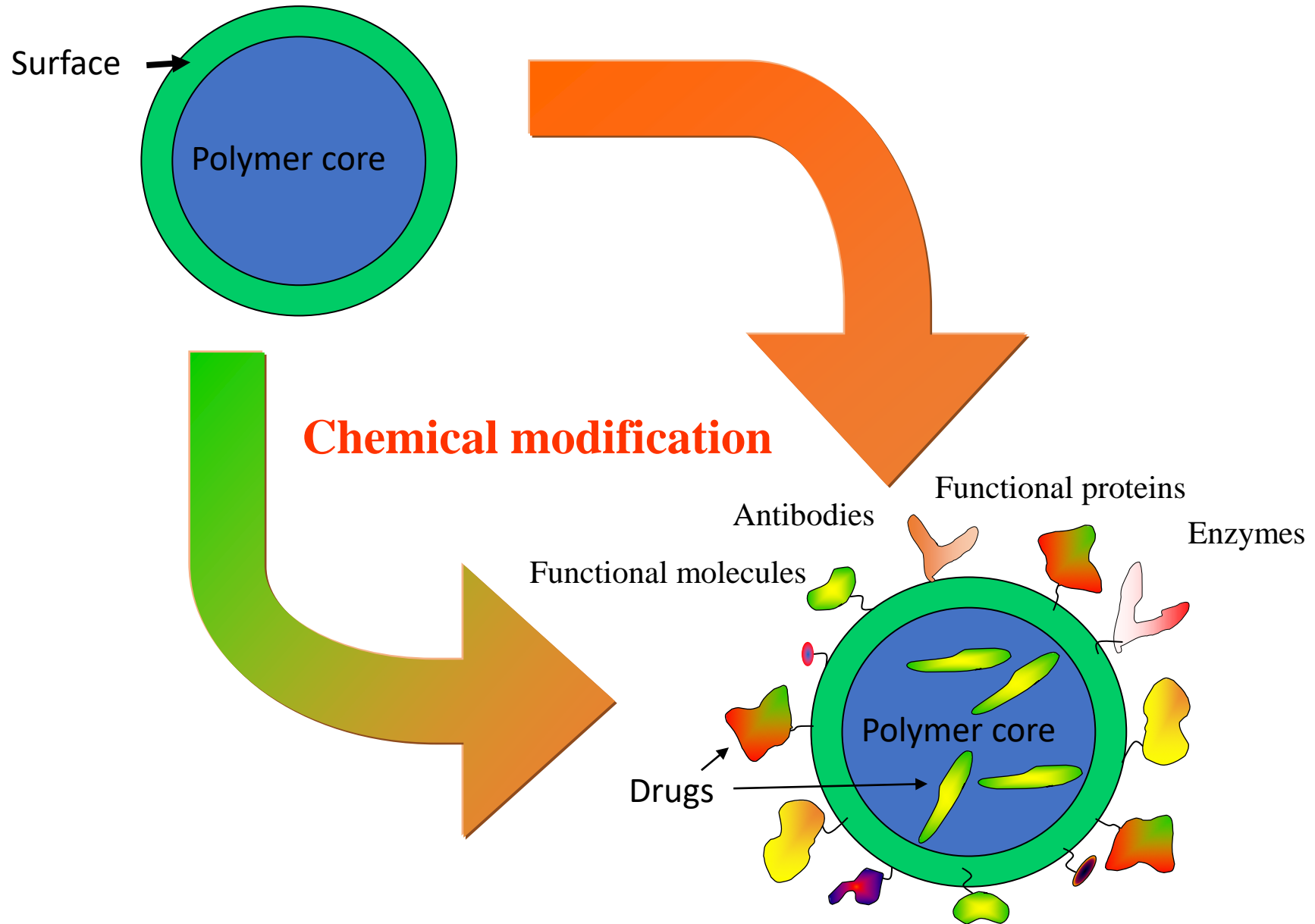
Bone composites

Drug delivery

3D Printing of scaffolds

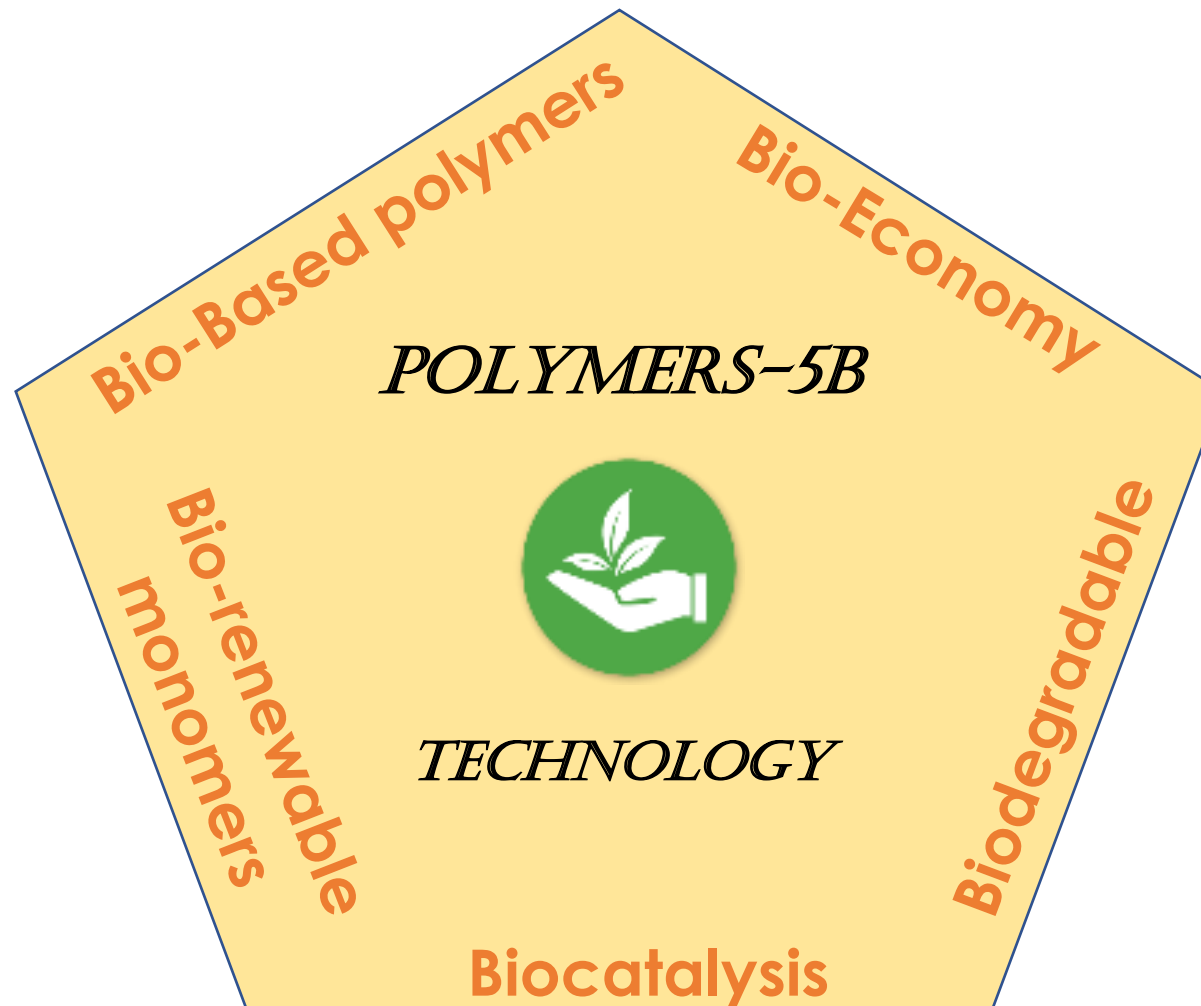


Plastic-4B - Biodegradable Polymers in drug delivery applications easy to design and activate surface.



Analysis objectives, scopes, outcomes, KPIs of the call **Horizon-JU-CBE-2023-R-04**

Type	Topic asks for...	OUR Proposal / Idea / Capabilities
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The CBE JU Networking-platform (<https://www.cbe.europa.eu/networking-platform>)

The iBB at Lisbon University is preparing the POLYMERS-5B project for the call **Horizon-JU-CBE-2023-R-04**.

1. Develop new bio-based and biodegradable polymers and co-polymers (e.g., polyesters, polyurethanes, and others) via biocatalysis from a broader range of bio-based monomers aiming for “zero waste” and “zero pollution” operations.
2. The project aims to provide polymers with tailor-made properties answering to actual limitations associated with conventional oil-based polymers and looking for new applications.
3. The bio-based and biodegradable polymers can be easily depolymerized and hydrolyzed using enzymes and/or green-chemistry processes and technologies, improving the process sustainability, and circular economy.

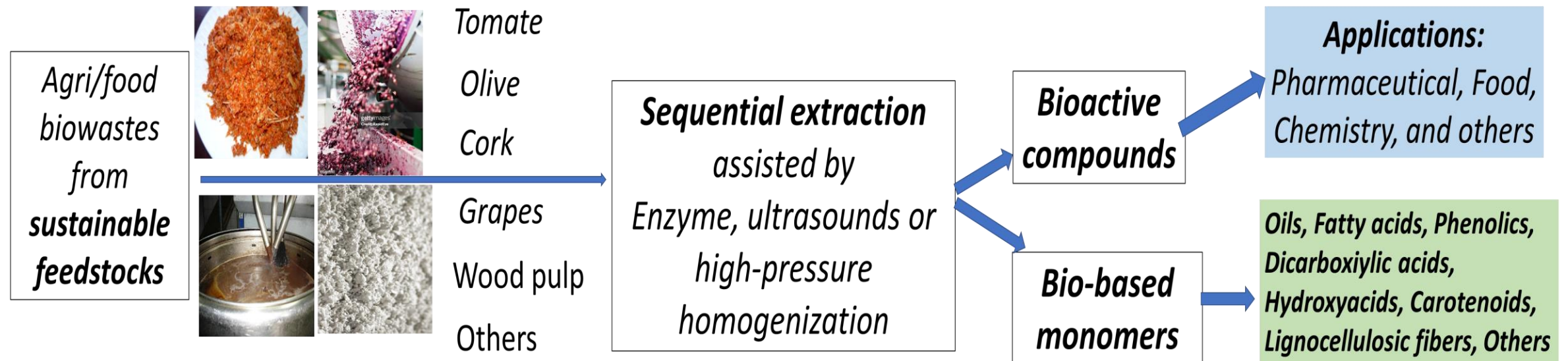
The present project proposal is looking partners for:

- Polymer characterization
- Polymers testing by end-users
- Sustainable, economical, and EoL demonstrations
- Develop models based on AI between polymers, composition, and properties

Sustainable, processes, materials, and Bioproducts

Biocatalysis, Green Chemistry, Biorefineries and Circular Bio-Economy

Biowaste products technology - Sustainable extraction of multiple products from Biowaste Agri/food processing



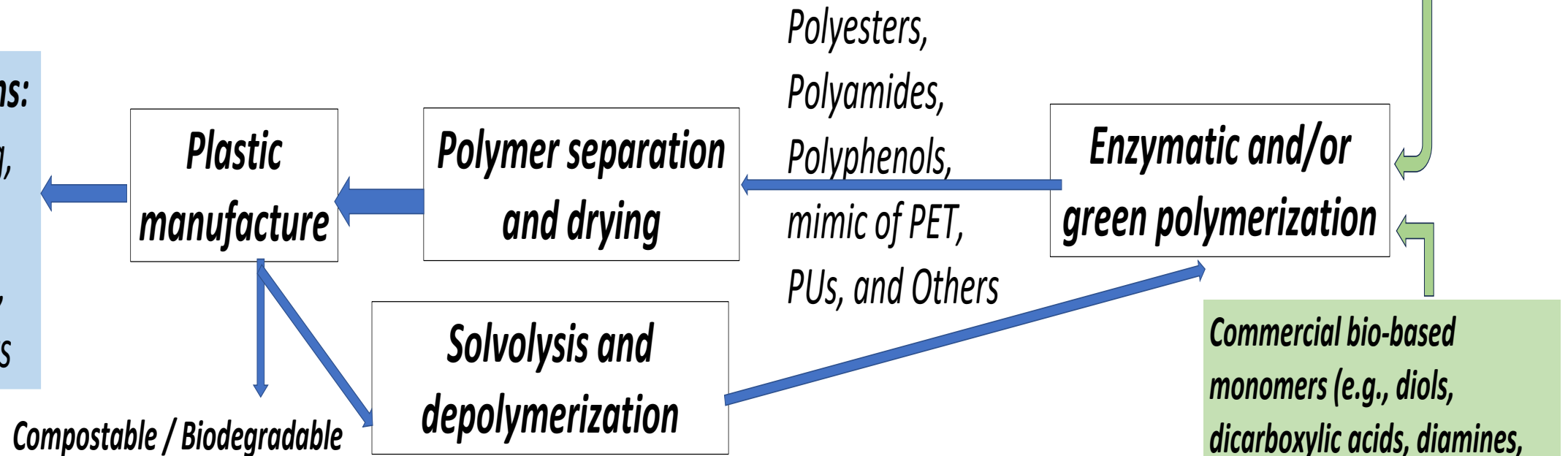
Back-ground and expertise of IST / iBB for the POLYMERS-5B project for the call **Horizon-JU-CBE-2023-R-04**.



Polymers-5B technology - Synthesis of **Biobased** and **Biodegradable** polymers using monomers from renewable **Biowastes** via **Biocatalysis** and Green Chemistry to contribute to European Circular **Bioeconomy**

Oils, Fatty acids, Phenolics, Dicarboxylic acids, Hydroxyacids, Carotenoids, Lignocellulosic fibers, Others

Applications:
Packaging,
Textiles,
Furniture,
and others



- 1) PT 116045 (2020) and PCT/PT2020/050051 and published as WO 2021/137711 A1. (2021) Synthesis of Polyesters in Aqueous Polymerization Media "from de Solid to Solid" via Biocatalysis. <https://patentscope.wipo.int/search/pt/detail.jsf?docId=WO21137711>;
- 2) ACD Pfluck et al. (2022) Processes 10 (2), 221 <https://doi.org/10.3390/pr10020221>;
- 3) ACD Pfluck et al. (2021) Processes 9 (2), 365. <https://doi.org/10.3390/pr9020365>

Polymers-5B workflow to obtain bio-based and biodegradable polymers and final applications

