ACTPAC

A Complete Transformation PAth for C-C backboned plastic wastes to high-value Chemicals and materials

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PROJECT **BACKGROUND**

Plastic pollution has become a clear threat to many environmental niches and ecosystems, due to rapidly increasing use of plastic products and leakage to the environment. With about 30 % of total plastics, Polyethylene (PE) is the most widely used and the largest-volume plastic. Due to the absence of reactive groups, the C-C backboned plastics are often categorized as non-degradable; generally disposed of by incineration or landfill. About 12 % of plastic wastes are recycled as goods with inferior quality and performance. The real catalytic route for upcycling of PE wastes into value-added products is less than 1%. It is clear that there is an urgent need to develop new routes for innovative upcycling of plastic wastes towards a paradigm shift in the plastic economy.

The ACTPAC project aims to establish a complete industry-viable transformation route for the conversion of non-degradable plastic wastes into high value chemicals and biodegradable polyesters with PE-like properties. Thus, a zero-pollution, bio-based solution to the existing environmental challenge is created, by keeping plastic wastes out of the environment, while reclaiming their values for a better circular bioeconomy. To this end, a series of technologies and innovative chemo-/biological transformation systems will be developed and demonstrated at pilot scale. The properties and specific applications of the new polyester plastics produced from upcycling of PE waste will offer new business opportunities for SMEs by scalable, flexible and robust multi-product manufacturing processes for on-demand and small-volume output production.

PROJECT **METHODOLOGY**

ACTPAC will develop new chemico-biological pathways and catalysts to degrade polyethylene (PE) into multiple catalogues of value-added chemicals, including alkanes, monomers and biodegradable, fully recyclable polyesters, that can be used for various industrial applications. ACTPAC's new biodegradable, and fully recyclable polyesters will have similar or even better mechanical and composable performances compared to PE. By reclaiming new value out of PE plastic wastes and by mitigating plastic pollution, the project will have a significant, positive impact on the environment, biodiversity and the ecosystem's balance and will contribute to the restoration of water, sea, and soil.

PROJECT **OBJECTIVES**

DEVELOP new catalysts for the deconstruction of polyethylene (PE) to enable the production of value-added, biologically utilizable chemicals at reduced costs.

ENGINEER enzymes and microbial cell systems that can produce value-added biochemicals for use in the chemical industry from biologically utilizable chemicals.

CONSTRUCT engineered non-pathogenic yeast systems that can transform biologically utilizable chemicals into value-added biochemicals for use in the chemical industry.

DEFINE efficient chemical routes and develop catalysts to convert value-added biochemicals into new breakthrough, biodegradable polyesters for various applications.

CREATE a completely novel, biobased polyester that has similar or better properties as polyethylen, but is fully biodegradable, and recyclable

DEMONSTRATE the improved environmental and economic performances of the value-added chemicals and alternative polyesters developed in the project and achieve zero-waste management.

BOOST the awareness on the project outcomes through communication and dissemination activities and engage main actors of the value chain as well as young professionals and early career investigators.

PROJECT **CONSORTIUM**

Aarhus University	1
Aarhus | Denmark	
University of Münster	3
Münster | Germany	
University of Groningen	5
Groningen | Netherlands	
BIOLYNX	7
Gent | Belgium	
MINDS & SPARKS GmbH	9
Vienna | Austria	
Footwear Technology Center of La Rioja	11
Arnedo | Spain	
Utrecht University	2
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National Centre for Scientific Research	4
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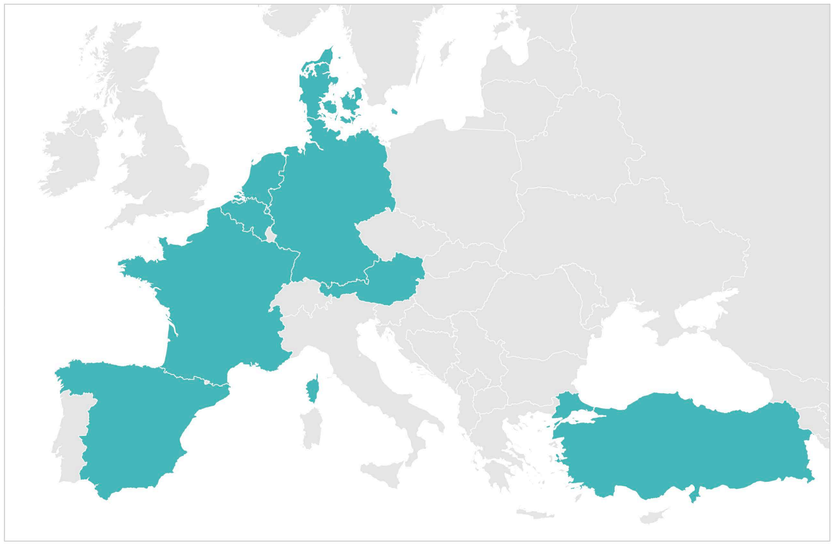
Innovaplast Biotechnology Inc.	8
Eskişehir | Türkiye	
B4Plastics	10
Dilsen-Stokkem | Belgium	



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