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TOPIC(s) : Enzyme engineering & Discovery / Industrial biocatalysis

## PET RECYCLING: FROM ENZYME AND PROCESS OPTIMIZATION TO AN INDUSTRIAL PLANT

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### PURPOSE OF THE ABSTRACT

Plastics are found everywhere in our daily life due to exceptional properties. The worldwide market reaches 400 million tons. However, they represent a major environmental issue with 125 million tons of generated plastic waste annually. Only 10% of collected plastics are recycled, and, at best, plastic wastes are incinerated but an unacceptable quantity are lost in nature, with 9 million tons ending each year in the oceans.

Carbios (<http://www.carbios.com>), a young innovative green chemistry company, in collaboration with the laboratory TBI (Toulouse Biotechnology institute; INSA/CNRS/INRAE; <http://www.toulouse-biotechnology-institute.fr>), developed an enzymatic process to recycle one of the main plastics, PET (~100 million tons per year). A first breakthrough was reached with the optimization of an extraordinary PETase used to break down PET returning to monomers (Nature; Vol. 580 Issue 7802, 9 April 2020). Since then, we continue to optimize this enzyme, to improve kinetics and yields and the performances of our best enzymes will be presented. The scale-up of the process in an industrial demonstrator will be presented with a 20m<sup>3</sup> reactor and all the downstream processing to purify both terephthalic acid and ethylene glycol.

Carbios is building a first industrial unit in France, operational in 2025, which will recycle 50,000 tonnes of PET waste per year.

# FIGURES

FIGURE 1

FIGURE 2

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## KEYWORDS

PET recycling | enzyme engineering | PETase | industrial plant.

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## BIBLIOGRAPHY