

The logo consists of two overlapping circles, one purple and one teal, positioned to the left of the text.

CARBIOS Active

Improving circularity of biopolymers

Making PLA-rich products 100% compostable & methanisable

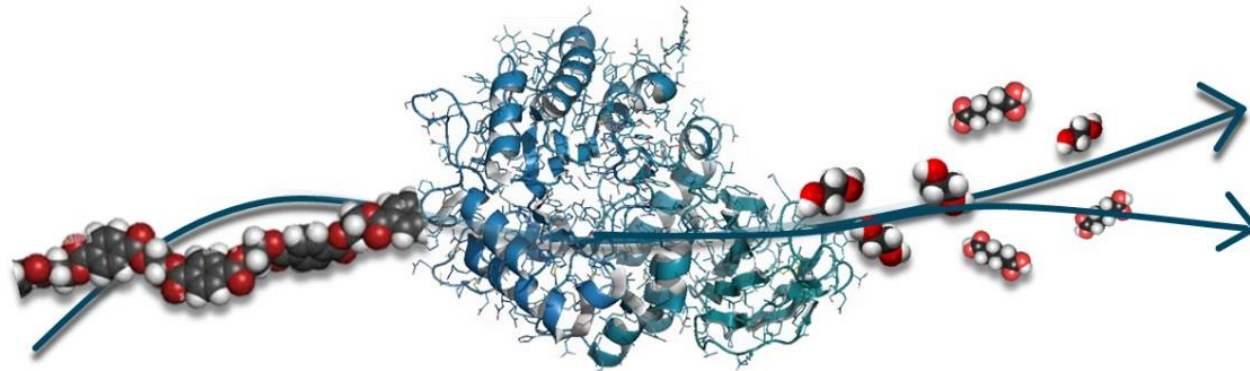
ADEBIOTECH meeting

March 2025



Our mission

To develop enzymatic solutions to deconstruct plastic and textile waste



Enzymatic
recycling



Enzymatic
Biodegradation

POLYMERS
(plastic and fibers)

CARBIOS ENZYMES

**VIRGIN QUALITY
MONOMERS**

POSSIBLE RECOVERIES



Carbios' solutions certified by Solar Impulse

Our technologies

Two breakthrough technologies on an industrial and commercial scale:



PET
BIORECYCLING



PLA
BIODEGRADATION



INNOVATION
ON OTHER POLYMERS

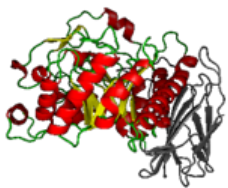
Ongoing research to bring a broad portfolio of technologies to market



Expanding circular routes for PLA based biomaterials

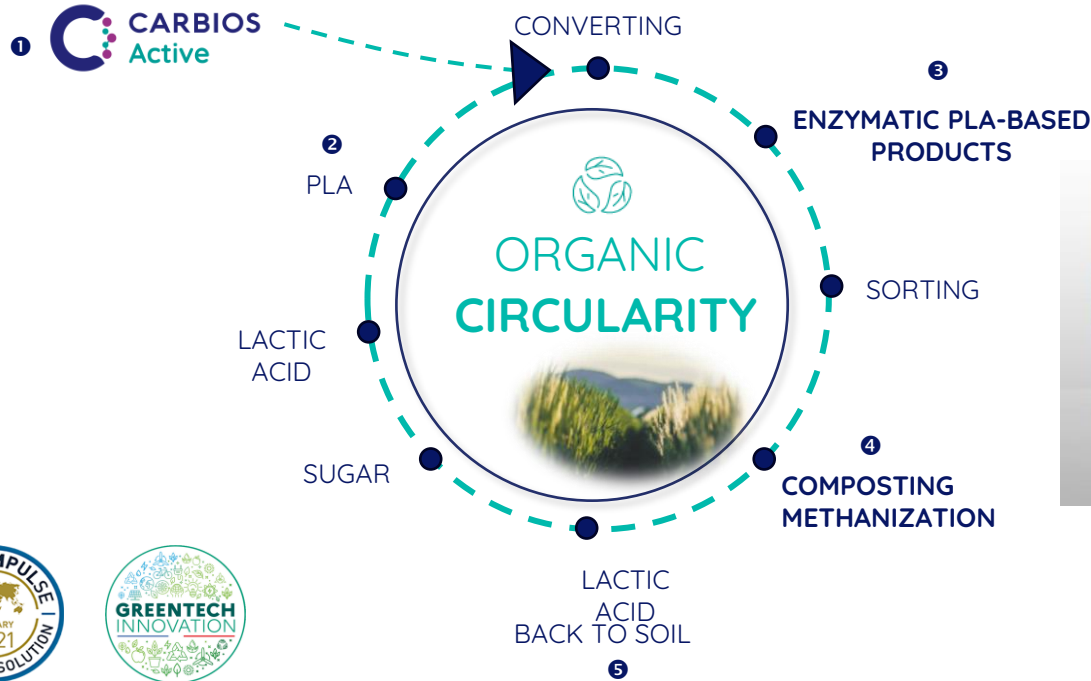
New access to composting & methanisation options

- What do we bring to the market?
 - Wider composting & methanisation options for polymer products using PLA
- What do we offer?
 - The right **enzyme** to depolymerize PLA back to **lactic acid**
 - A unique **encapsulating technology** allowing:
 - Regular PLA processing
 - WHILE preserving the active enzymes



Opening new routes for biopolymers

The CARBIOS Active circular model





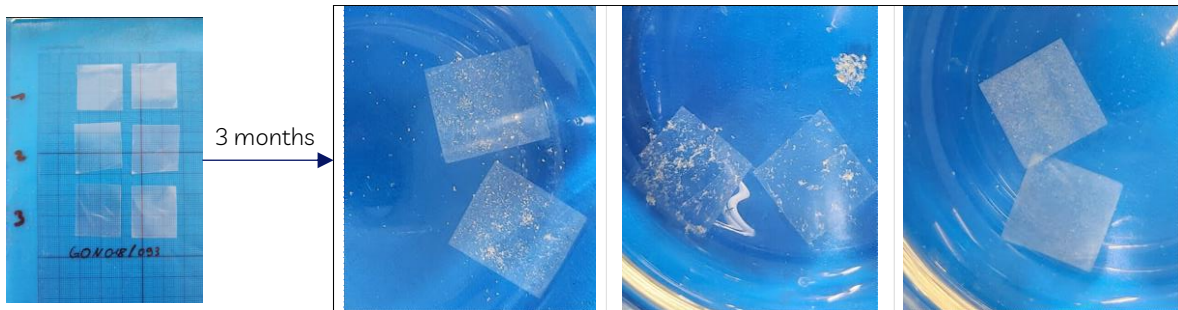
The seawater disintegration test in a nutshell

- Test conditions: immersion in seawater and incubation at 30°C with agitation
- Test duration: 12 weeks
- Standard followed: ASTM D66921 December 2017
- Sample: ~2*2cm piece
- Test validation: sample disintegrated to at least 90% by mass after sieving on a 2m*2mm sieve.

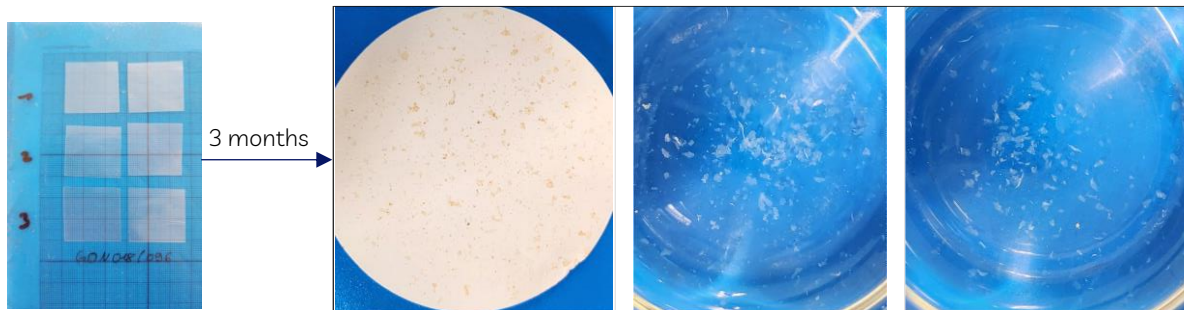
Seawater disintegration at 30°C

35µm film immersed in seawater at 30°C

60% PLA/ 40% PHA



55% PLA / 40% PHA /
5% CARBIOS Active

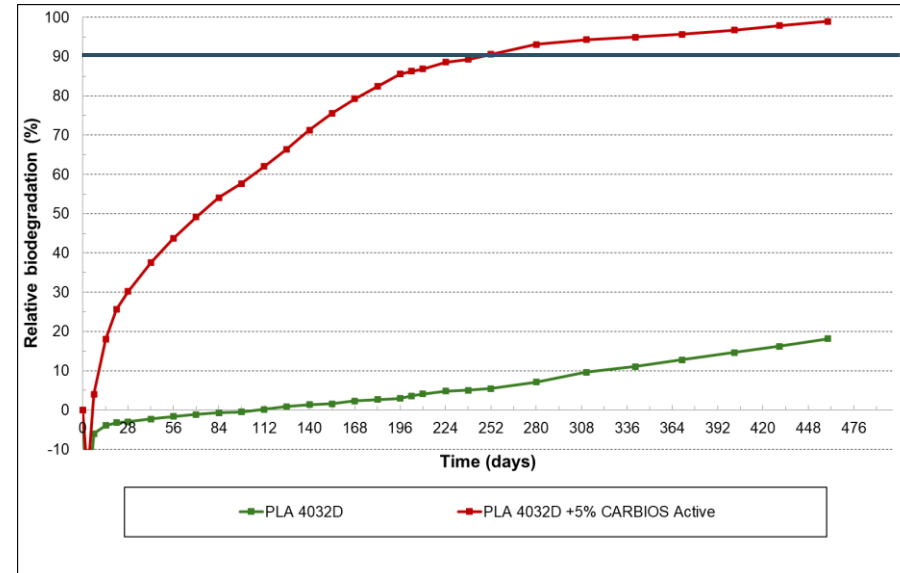
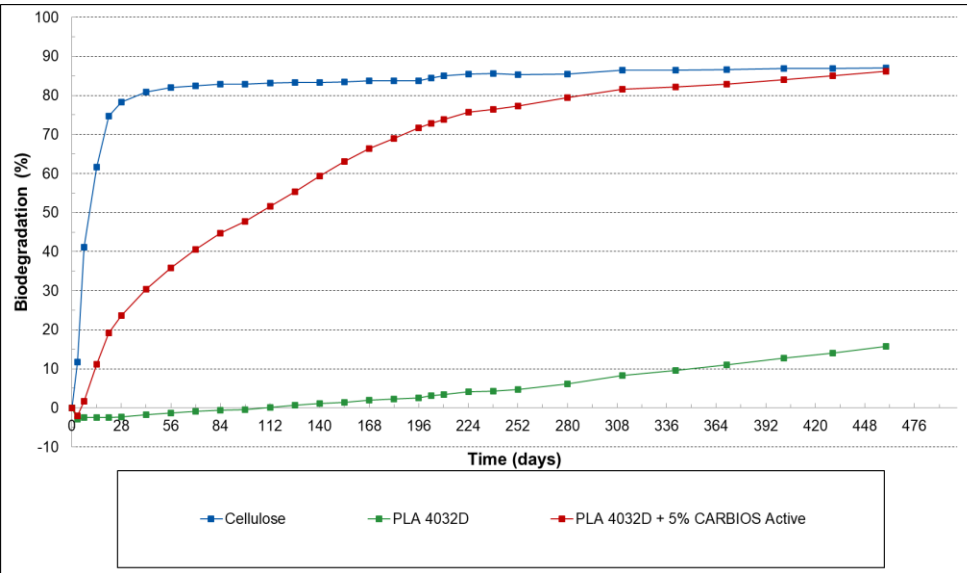


98,6%
disintegrated



Seawater biodegradation at 30°C

Samples tested at Normec OWS



➤ 90% relative biodegradation reached in 252 days for PLA thanks to CARBIOS Active



CARBIOS Active, the guarantee for full composting



Fully biodegradable
No micro-plastics
No residues



Ambient temperature

Secure PLA
disintegration



Improve organic waste collection

Limit contamination



Perfect fit non-recycled packaging & fibers

Limit landfill or incineration



Micro-organisms + T° + H₂O + pH = Compost = enzyme activation

Packaging shelf-life & performances maintained

Annex

Biodegradation (soil & home) data



CARBILICE

Biodegradability is the future



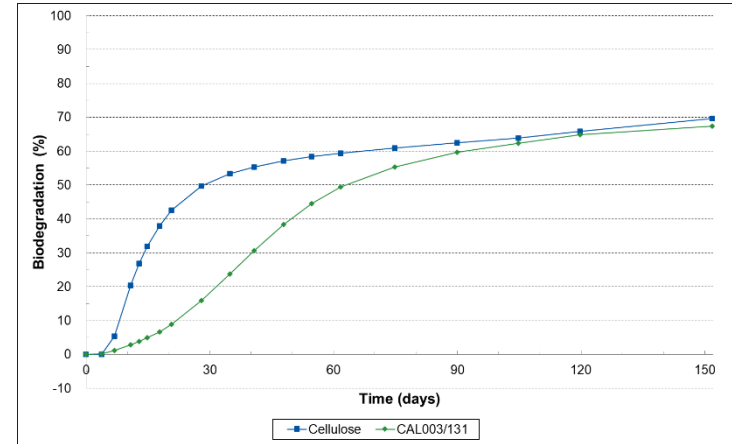
PLA + 5% CA: biodegradation in soil validated



Table 1. Overview of the performed tests

Description	Test item code	Test item CAL003/131
Material characteristics*	NACA-31/1	OK
Aerobic biodegradation test in soil	NACA-31/2BIS	67.4% ± 0.1% absolute and 96.8% relative biodegradation after 152 days OK
Soil preparation	NACA-31/3	Addition of 1% CAL003/131 (on wet weight basis) to natural soil and incubation at 25°C ± 2°C during approximately 4 months OK
Barley test	NACA-31/4	No negative effect on the emergence and growth of barley plants after a 130 days stabilization period in soil OK
Cress test	NACA-31/5	No negative effect on the emergence and growth of cress plants after a 134 days stabilization period in soil OK

* Volatile solids content, heavy metals content and fluorine content.



- ✓ CARBIOS Active does enhance soil degradation of PLA-rich products @ ambient temperature
- ✓ Agricultural applications are obvious applications (mulching, clips, pots ...)





Normec OWS confirm Home Compost up to 800 microns (95% PLA/5% CARBIOS Active)



Type of test	Target for the Ok Home
Ecotoxicity	No impact on cress germination and growth
Chemical characterisation	No fluor and no metal detected (or very small amount)
Disintegration 28°C (82°F)	90% in 26 weeks
Biodegradation 28°C (82°F)	90% in 52 weeks

Results at OWS*	
Ecotoxicity	Validated
Chemical characterisation	Validated
Disintegration 28°C (82°F)	16 weeks for 90µm (4 mils)
	25 weeks for 800µm (31 mils)
	26 weeks for 2mm (78 mils)
Biodegradation 28°C (82°F)	90% in 32 weeks

*Laboratory recognised by TUV Austria to perform the tests for the Ok Home certification