



- Press release -

## **CARBIOS depolymerizes 100% of PET based plastic waste with its enzymatic recycling process**

- ✓ *A unique technology paving the way to infinite recycling of PET*
- ✓ *At the time of the COP21, the biorecycling of PET by CARBIOS follows a new life-cycle model of circular economy contributing to the fight against global warming*

**Clermont-Ferrand, France, December 2, 2015** – CARBIOS (NYSE Alternext in Paris: ALCRB), an innovative green chemistry company specializing in breakthrough technologies dedicated to the recovery of plastic waste and the production of bio-polymers, announced today that it has taken a major step forward in the development of its enzymatic depolymerization process of polyesters rendering it applicable to PET (polyethylene terephthalate), one of the most commonly used polymers. This process, property of CARBIOS, enabled for the first time the depolymerization of 100% amorphous PET based commercial products into its original monomers, TPA (terephthalic acid) and EG (ethylene glycol).

Applying this selective depolymerization to PET enables the regeneration of monomers while maintaining the same quality and physicochemical properties as their petroleum-based counterparts. After separation and purification, the monomers extracted from the enzymatic recycling process developed by CARBIOS could then be used for the synthesis of virgin PET, therefore avoiding any loss in value of the recycled material.

This new milestone, achieved within the THANAPLAST™ project, is the result of a close collaboration between the Toulouse-based teams of the INRA, TWB and the laboratory LISPB from INSA Toulouse. Pierre Monsan, founding-director of TWB says, “We are particularly proud of these results. They reflect the success of a public-private partnership dedicated to the development of competitive ecological innovations optimizing the life-cycle of plastics. It’s with the vision and commitment of companies such as CARBIOS that we’ll soon be able to bring this disruptive innovation to an industrial stage.”

The market of PET plastics, a fossil-based polyester commonly used in the industry, represented a world production of 21 million tons in 2014<sup>1</sup>. With an annual growth rate of 4 to 5%<sup>2</sup>, production could reach more than 26 million tons by 2020. This thermoplastic material is widely used for manufacturing plastic bottles (69% of PET plastics), films (14%) and packaging (10%) and in other applications. The exceptional properties of PET (flexibility, transparency, thermomechanical strength, lightness, durability) make it an outstanding material favored by most plastic bottles manufacturers. However,

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<sup>1</sup> : Source SRI Consulting in 2010, ICIS in 2009 and Samsung in 2010

<sup>2</sup> : Source Smithers Pira in 2014, Icis in 2009 and Pira International in 2012

conventional technologies implemented to recycle PET waste are very sensitive to contamination by other polymers and impurities. On a practical level, this involves a sophisticated sorting and high costs for a limited recycling rate. In addition, current technologies are leading to the production of secondary products of lower quality. Moreover, complex waste material made out of several polymers including PET cannot be recycled by conventional processes.

In Europe, demand for PET-based virgin plastics was estimated at 3.2 million tons in 2013<sup>3</sup>, of which 1.8 million tons are recycled (57%<sup>4</sup>). Applying CARBIOS' biorecycling process to PET would allow for treatment of 100% of PET waste, equal to an addition volume of 1.4 million tons in Europe which are presently left in landfills or incinerated instead of being recycled. By creating a true circular economy model, CARBIOS' biorecycling processes would prevent the emission of 4.6 million tons of CO<sub>2</sub> equivalent<sup>5</sup> (applied solely to the PET plastics in Europe), thus contributing actively to the European efforts to limit global warming to 2°C above the temperature of the preindustrial period. To this resource could be added PET fibers, for which the recycling rate is very limited today despite a production estimated at 43 million tons worldwide<sup>6</sup> in 2014.

CARBIOS provides a concrete solution to address today's industry issues by rendering PET endlessly recyclable with no loss in value whether it is plastic or fiber material composed of PET. Moreover, the processes developed by CARBIOS use highly selective enzymes, eliminating the need for a sorting step and offering the prospect of a 100% recycling rate and the production of high performance plastics composed entirely of recycled PET. In addition, CARBIOS biorecycling is a low energy consumption process, ensuring long-term control of the energetic cost of the process.

These results represent a major milestone in the future transition of CARBIOS processes from the status of disruptive innovation to a leading industrial technology. By lowering the environmental impact of plastic waste, CARBIOS technologies will be best placed to support the expected orientations of "the circular economy package" that will be presented by the European commission early December in Brussels.

"We are very proud of these results, which lend further credibility to the innovation strategy and collaborative model established within the framework of the THANAPLAST™ project. These new progresses will enable us to pursue our efforts and undertake the development at the pilot scale of our PET recycling process and adapt this technology to the recycling of other plastic polymers. We are also conducting advanced discussions with many major players in the industry in order to quickly bring our innovation to an industrial level." stated Jean-Claude Lumaret, CEO of CARBIOS.

### **About CARBIOS**

CARBIOS is a young, innovative green chemistry company, whose mission is to find biological solutions to the environmental and sustainable development issues faced by industrial businesses today. CARBIOS acquired the rights to research that was conducted over a number of years by various public and private sector laboratories. By leveraging the unique properties of biological catalysts (enzymes), it has used this research as the foundation for developing innovative industrial bioprocesses that optimize the technical, economic and environmental performance of polymers (thermoplastic materials and synthetic or food-based fibers). The company has focused its efforts on a strategic application sector: plastics. CARBIOS' growth strategy is based on a clear business model of industrial

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<sup>3</sup> : Source PlasticsEurope in 2014

<sup>4</sup> : Source Petcore Europe in 2015

<sup>5</sup> : Source « Emission factor, PET production from raw material » given by CDC Climat Research in its document "Waste recycling and fight against climate change : case study of household packaging" dated June 2015

<sup>6</sup> : Source Tecnon in 2013 and IHS in 2014

value creation that targets attractive markets, develops innovative and competitive bioprocesses and licenses them to major industrial stakeholders for commercialization. CARBIOS benefits from the financial support of the leading European venture capital firm Truffle Capital. Carbios was founded in 2011 and has been managed, since its inception, by the *Holding Incubatrice Chimie Verte* fund. CARBIOS was granted the label “Young Innovative Company” by Bpifrance (former OSEO) and is eligible for investments by private equity mutual funds (FCPIs).

For more information, please visit: [www.carbios.fr](http://www.carbios.fr)

CARBIOS is eligible for the PEA-PME, a government program allowing French residents investing in SMEs to benefit from income tax rebates.



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