Progress beyond

Solvay and Carbios demonstrate enzymatic depolymerization in PET/PVDC barrier film

Unique recycling technology helps the industry close the loop on PVDC-coated PET films

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Solvay and Carbios successfully demonstrated that multi-layer PET[1] films coated with Diofan® PVDC[2] high-barrier polymer are fully compatible for enzymatic depolymerization - Carbios' innovative recycling process. Results show that the PET is fully depolymerized, whereas the PVDC remains intact.

Carbios is the first company to have developed enzymatic processes dedicated to the end-of-life of plastics and fibers. The collaboration builds upon the results of an earlier proof of concept by Solvay which has confirmed that waste from packaging or other applications using bi-oriented PVDC multi-layer film can efficiently be recycled without compromising the outstanding barrier performance of the polymer. It aligns with Solvay One Planet's sustainability ambition to preserve resources and contribute to safer, cleaner and more sustainable products.

"OEMs and brand owners are under tremendous pressure to increase the sustainability of their products," says Guruprasad Sivakumar, Head of Marketing for Consumer, Healthcare and Environment at Solvay. "While PVDC has long been used for coating flexible PET films e.g. in food packaging, where it delivers impressive barrier properties, these multi-layer structures have been challenged regarding their recyclability. This is where Carbios' unique recycling technology comes as a real game changer. By providing a feasible and sustainable end-of-life management solution, it can help the industry close the loop on PVDC-coated PET films and extend the value proposition of our high-barrier specialty polymers to further markets, such as the packaging of pharmaceutical products."

The patented recycling process developed by Carbios works with specific enzymes to break down the PET molecules back into their constituent monomers. The technology uses moderate temperatures, which is ideal in the presence of PVDC, and can be applied to recycle post-industrial as well as post-consumer waste. The resulting monomers could be purified for reuse in the production of a new PET polymer of the same quality as those derived from virgin petrochemical feedstock. Notably, the joint study by Solvay and Carbios has demonstrated that PVDC does not jeopardize the depolymerization of PET.

[1] polyethylene terephthalate

[2] polyvinylidene chloride

"Our enzymatic approach overcomes the limitations of other recycling processes," explains Alain Marty, Chief Scientific Officer at Carbios. "Conventional thermo-mechanical routes require clean-mono-material grade waste, and high-heat chemical or pyrolytic recycling cannot be used to regain the material value still present in many end-of-life applications. As the industry's first solution for the recycling of complex multi-layer structures such as PVDC coated PET films, our enzymatic biological recycling makes a significant contribution to help the plastics economy become more circular. The joint study with Solvay also shows what can be achieved by collaborating towards a common goal – to the benefit of all players along the value chain."

Solvay's Diofan® and Ixan® high-barrier polymers have a track record of proven food packaging applications from fresh and processed meat to fish, poultry and cheese. They provide a superior barrier against the permeation of both water vapor and oxygen – most existing alternatives only meet one or the other purpose – as well as to odors and loss of aroma or flavor.

Diofan® and Ixan® are registered trademarks of Solvay.

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About Solvay

Solvay is a science company whose technologies bring benefits to many aspects of daily life. With more than 21,000 employees in 63 countries, Solvay bonds people, ideas and elements to reinvent progress. The Group seeks to create sustainable shared value for all, notably through its Solvay One Planet roadmap crafted around three pillars: protecting the climate, preserving resources and fostering a better life. The Group's innovative solutions contribute to safer, cleaner, and more sustainable products found in homes, food and consumer goods, planes, cars, batteries, smart devices, health care applications, water and air purification systems. Founded in 1863, Solvay today ranks among the world's top three companies for the vast majority of its activities and delivered net sales of €10.1 billion in 2021. Solvay is listed on Euronext Brussels and Paris (SOLB). Learn more at www.solvay.com.

About Carbios

Carbios, a green chemistry company, develops biological and innovative processes representing a major innovation in the end of life of plastics and textiles. Through its unique approach of combining enzymes and plastics, Carbios aims to address new consumer expectations and the challenges of a broader ecological transition by taking up a major challenge of our time: plastic and textile pollution. Established in 2011 by Truffle Capital, the mission of Carbios is to provide an industrial solution to the recycling of PET plastics and textiles (the dominant polymer in bottles, trays, textiles made of polyester). The enzymatic recycling technology developed by Carbios deconstructs any type of PET plastic waste into its basic components which can then be reused to produce new PET plastics of a quality equivalent to virgin ones. The Company has also developed an enzymatic biodegradation technology for PLA (a bio sourced polymer) based single use plastics. This technology can create a new generation of plastics that are 100% compostable in domestic conditions, integrating enzymes at the heart of the plastic product. This disruptive innovation has been licensed to Carbiolice, a joint venture created in 2016, which is now Carbios' subsidiary. Learn more at www.carbios.com.