

Irish and French led Research Teams kick start a global plastics revolution

An international academic and industry research consortium securing €12 million across two EU and China funded projects targeting problematic multi-layered plastics

Researchers at Athlone Institute of Technology (AIT) and Sigma Clermont begin joint work this month on two projects to develop novel technologies which will separate, treat and repurpose multi-layered plastics. The two projects, entitled BioICEP and TERMINUS, have been awarded a total budget of €11.6 million under Horizon 2020, EU's Framework Programme for Research and Innovation and the National Science Foundation of China.

The scale of the problem is immense, but often goes unseen. Multi-layered packaging, for example, crisp bags and other ready-to-eat snacks within shiny packets, account for up to 56% of plastic packaging in developed countries. It is estimated that every residence in the U.S.A uses 27kg of multilayered plastic films each year. While they cover many supermarket foods and other perishable products, multilayer plastics are notoriously difficult to separate into discrete layers that can be effectively recycled.

By the end of the projects, in four years, researchers hope that the combined outputs from both projects will herald in a new generation of green technologies transforming how we live with plastics. The projects each focus on a specific aspect of the plastics life cycle that when combined will close the loop from our linear processes into one of circularity. The TERMINUS project is the starting point. It aims to develop new a biotechnology specifically designed to separate out the layers plastic from multi-layered plastics and packaging using enzymes to degrade the layers of adhesive holding the plastics together. The technology developed through BioICEP will take the individual layers of plastic generated through TERMINUS and break these down further into their chemical constituents (a process known as depolymerisation) using combined green mechano-chemical and enzymatic technology. In essence, the two projects will turn petroleum derived plastic waste into individual building blocks for new replacement eco-plastics that are not harmful to the environment. Combining the BioICEP and TERMINUS technologies provides a route to upcycling multi-layered plastics and using their constituent molecules to create products that are perpetually regeneratable delivering full plastics circularity.

The BioICEP-TERMINUS collaboration is a compelling ecological-based proposition to address the global environmental plastics challenge, simultaneously creating new opportunities for industry to transition from a linear model of petroleum-based plastics production to a production model based

on circularity. AIT researchers believe that the outputs from these projects could open up potential new markets for eco-based technologies and product development: the cornerstone of a circular economy that works for business, society and the environment.

Prof. Vincent Verney, who coordinates TERMINUS, said “This is an excellent opportunity to work together and fuse our considerable research efforts, and ultimately provide new disruptive green technologies to deliver plastic circularity for the future prosperity of our people and the planet.”

Dr. Margaret Brennan Fournet, who coordinates BioICEP and leads the AIT plastics Circularity team said “We are absolutely delighted to have joined forces with the TERMINUS consortium and begun work on these exciting projects which will create an end-to-end waste management solution deal with multilayered plastics. The combined BioICEP and TERMINUS technologies provide a seamless route to resolving pervasive plastic pollution, particularly multi-layered plastics, converting it to Eco-plastic products. In essence, we’ll be taking in multi-layered plastic waste at one end, separating it using TERMINUS triggerable enzymatic technology then sending it on to the BioICEP technologies which will treat it, mechanically, green chemically and enzymatically to recover the molecules and building blocks, and use this as the starting point for new fully sustainable bioplastics and bioproducts.”

Dr. Declan Devine, director of AIT’s Materials Research Institute, which is focused on next generation polymeric innovation said, “Plastics packaging is the largest polluting plastic sector with multilayer packaging posing particularly intractable challenges. The disruptive green eco-technologies we are developing at AIT with our international colleagues will address this challenge and will enable us, as a society, to resolve the multifaceted problems posed by post-consumer plastics.”

Dean of Graduate Studies and Research at AIT, Dr. Maire Brophy said, “This is an outstanding example of how research collaboration can bring significant impact. This project will transform our relationship with plastics and plastic waste pollution, while opening up new technology markets.”

Pr. Sophie Commereuc, director of SIGMA Clermont, French Engineering Graduate School, which manages TERMINUS on behalf of the 12 partners involved in the project, said: “SIGMA Clermont combines advanced mechanics and chemistry to serve its commitment to sustainable development. TERMINUS bases its innovative and challenging objectives on a cross disciplinary team, what is the DNA of SIGMA Clermont. The association with BioICEP is a real opportunity to multiply our scientific and technological advances.”

The BioICEP and TERMINUS projects involve 28 Research Institutes and Companies in 15 countries funded through the EU H2020 programme and the National Science Foundation of China, supported by Enterprise Ireland.

About BioICEP

BioICEP is designed to pave route to a circular economy for plastics. BioICEP operating in tandem with nature and using novel combinations of mechano-green chemistry and microbial and enzymatic technologies to depolymerize and revalorization plastic waste. The project will funnel degraded waste plastic carbonaceous resources for the fermentation of new equivalent biopolymer plastics and bioproducts.

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About TERMINUS

TERMINUS addresses the challenge of unlocking recycling and reuse of flexible multi-layer and multi-compounds packaging materials used for food, beverages, cosmetics, pet food, fertilisers, any perishable goods in general. It will develop a range of smart enzyme-containing polymers with triggered intrinsic self-biodegradation properties, acting as adhesives or tie layers in the design and manufacturing of multi-layer plastics for food and non-food applications.

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