

Athlone Institute of Technology leads global effort to tackle plastic pollution and develop next-generation materials

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Developing a full plastics circularity has the potential to contribute to a significant reduction in greenhouse gas emissions, resource efficiency and job creation

Innovation of a Circular Economy for Plastic), will seek to develop sustainable, environmentally-friendly alternatives to traditional petroleum-based plastic.

A number of innovative booster technologies are at the core of this solution – accentuating, expediting, and augmenting mixed plastics degradation to levels far in excess of those current achievable.

Drowning in plastic

Global production and consumption of plastic has grown exponentially in recent decades. Since the 1950s, approximately 8.3 billion tonnes of the material has been produced – 60% of which has ended up in landfill or the natural environment.

Researchers believe that it will take hundreds, if not thousands, of years for bacteria and the enzymes that they produce to evolve to a point where they can break down the long chains of

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Researchers from Athlone Institute of Technology's Materials Research Institute are spearheading a major pan-European Chinese research effort aimed at tackling plastic pollution – a global crisis of prodigious proportions.

The Horizon 2020 research innovation project, dubbed BioICEP (Bio



L-R: Lorna Walsh, AIT funded research manager, Dr Margaret Brennan Fournet, project BioICEP lead, Dr Declan Devine, director of the Materials Research Institute, and Dr Yuanyuan Chen, China liaison AIT research engineer.



(<http://www.engineersjournal.ie/wp-content/uploads/2020/01/a2-6.jpg>)

molecules that compose plastic. As a result, the accumulation of plastic is causing serious problems in the environment.

Director of the Materials Research Institute Dr Declan Devine, pictured with BioICEP lead, Dr Margaret Brennan Fournet.

According to Dr Margaret Brennan Fournet, a foremost authority on materials science and leader of project BioICEP, there are microplastics in the air we breathe, the water we drink and the food we eat. Scientists have even found them in remote mountain ranges.

“People may need to start using monitors, not just to measure air quality, but to measure the level of microplastics in the atmosphere – similar to how Geiger counters are used to measure radiation,” she says.

“It’s been suggested that people are ingesting a credit card-sized amount of plastic every week. These scientific results are only starting to come out now and every few months we’re hearing new, even more staggering results.”

Using an innovative triple action process, Dr Brennan Fournet and the BioICEP team will attempt to accelerate the degradation of traditional plastic and turn it into biopolymers, which can be used as natural biodegradable replacement plastics.

“In essence, we’ll be tacking in the mixed plastic waste at one end, treating it with bacteria and enzymes, recovering the molecules, fermenting them, and turning them into new bioproducts,” she says.

Indispensable to modern living

In many respects, plastic’s strength is actually its weakness. It’s sheer versatility and high resource efficiency has enabled innovations across many sectors, allowing for the development of new products and solutions.

Plastic has completely revolutionised how food is bought, stored and consumed. For example, beef that has been vacuum packed in multilayer plastic can last up to 45 days on the shelf. By extending the shelf life of food, food waste is kept to a minimum.

“It is near-impossible to buy food to feed your family in the supermarket without encountering some form of plastic,” says Dr Brennan Fournet. “Its myriad applications and low production costs has ensured its indispensability to modern living.”

With dependency on petroleum-based plastic showing no sign of abating, the race is on to create viable, ecological alternatives that won’t negatively impact companies’ bottom line or affect the consumer adversely.

“Our ultimate goal is not to change consumer behaviour as this alone isn’t sufficient to solve the problem. Instead, we’re trying to target manufacturers and give them a better option that won’t cost more and isn’t harmful to the environment,” she explains.

Plastic: In need of a rebrand

It's not just individuals who are looking for ecological solutions to the global plastic pollution crisis either. With more than one million plastic bottles being produced every minute, soft drinks manufacturers are under pressure to make their packaging more sustainable.

Companies like Coca-Cola have already started incorporating recycled PET, a plastic resin and member of the polyester family, into their packaging. Their goal is to make 100% of their packaging recyclable by 2025.

While other plastic substitutes, such as glass or sugarcane, are available to manufacturers, they can be significantly more expensive to produce and energy intensive to transport – resulting in a higher net carbon footprint.

According to the Athlone-based researcher, plastic is in need of a total rebrand: "It isn't public enemy number one – or at least it doesn't have to be. At the end of the day, we're extremely reliant on it – there's no escaping that. We do, however, need to be more considered in our approach to how we make and recycle it."

While bioplastics research is still emerging and as of yet most materials don't contain the performance properties required to ensure that they can be fully biodegraded, project BioICEP is a much-needed step in the right direction.

"These new plastics are not going to cause the problems that traditional petroleum-based plastics have caused because they will be easy to break down and recycle post use," says Dr Brennan Fournet.

Researchers spearheading change

The €5 million project, which will span four years, commencing in February 2020, will be led by Athlone Institute of Technology, a third level institute in the heart of Ireland with a significant expert knowledge base and strong industry connections.

"Our researchers have long been at the forefront of plastics research and development and have been working on solutions to the global crisis of plastic pollution for more than 10 years in association with Enterprise Ireland," says Dr Declan Devine, director of the Materials Research Institute.

The BioICEP approach to tackling mixed plastic waste has the potential to circumvent many of the current challenges associated with plastic packaging materials which will be essential in resolving current environmental damage.

Two other Irish third level institutes will partner on the project: Trinity College Dublin and Limerick Institute of Technology.

In total, nine countries – totalling 15 partners – have been selected to participate in the pan European Chinese research collaboration, each of whom represent different mixed plastic pollution environments.

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