



Society depends heavily on plastics for the vast majority of objects essential for everyday life. They are present in our furniture and toys, in the packaging of our foods and beverages, and even in the pharmaceuticals and cosmetics we use. Plastics are also used in the manufacture of clothes, car components, and household structures such as walls, ceilings, lavatories and electrical goods. However, only a small fraction of plastic waste is usefully recycled. Far too much is discarded into the environment where it degrades to nanoparticles that are consumed by wildlife in diverse ecosystems, often burdened with adsorbed environmental contaminants. Moreover, plastics generated from the oil industry degrade too slowly to prevent serious environmental pollution. Against this backdrop, hundreds – perhaps thousands – of companies worldwide are developing new products that both compete economically with traditional oil-based products and minimize the negative effects of their disposal when they become waste. A major goal for biotechnology is to produce a wide range of products suitable for recycling or rapid biodegradation. The on-line meeting in March 2024 was a joint event with our partner Federation AFOB (the Asian Federation of Biotechnology), to explore the range of new biobased materials that are becoming available. Sessions focussed on enzymes required for their synthesis or modification; their applications; and biodegradability. A fourth session reviewed the impact of plastics on the environment.

The topics covered included:

- Enzymes required for their synthesis or modification
- Applications
- Biodegradability
- Impact of plastics on the environment

Plastics

Challenges and Biotechnological Solutions

20 March 2024 Virtual conference



Scientific Programme

All times in CET

Wednesday, 20 March 2024

Session 1: New biobased plastics and biodegradation

Chair: **Jeff Cole**, EFB President, United Kingdom

9:00 – 9:05	Welcome and introduction: Jeff Cole , EFB President, United Kingdom
9:05 – 9:25	Keynote lecture: Establishing polyamides as novel feedstock for microbial biotechnology, Nick Wierckx , Forschungszentrum Jülich, Germany
9:25 – 9:45	Keynote lecture: Enzymatic synthesis and structural modelling of bio-based oligoesters as an approach for fast screening of marine biodegradation and ecotoxicity, Anamaria Todea , Polytechnical University of Timisoara, Romania
9:45 – 9:55	Valorisation of cassava waste into polyhydroxyalkanoates: integration of biomass pretreatment and biological conversion, Alfred Fernandez-Castane , Aston University, United Kingdom
9:55 – 10:15	Keynote lecture: New biobased materials through selective enzymatic catalysis, Alessandro Pellis , Università degli Studi di Genova (UNIGE), Italy
10:15 – 10:35	Keynote lecture: Plastics from biobased wastes, Idalina José Monteiro Gonçalves , University of Aveiro, Portugal
10:35 – 10:45	Polyhydroxyalkanoates as biobased polymers produced by bacteria using renewable feedstocks, Justyna Możejko-Ciesielska , University of Warmia and Mazury in Olsztyn, Poland
10:45 – 10:50	ECB2024 announcement, Jeff Cole , EFB President, United Kingdom
10:50 – 11:10	<i>break</i>

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Session 2: New biobased plastics and biodegradation

Chair: **Alessandro Pellis**, Università degli Studi di Genova (UNIGE), Italy

Session co-organised by the Biobased Materials Division of the European Federation of Biotechnology

- 11:10 – 11:15 Introduction: **Alessandro Pellis**, Università degli Studi di Genova (UNIGE), Italy
- 11:15 – 11:35 Keynote lecture: Polyhydroxyalkanoate (PHA) circularity, the role of PHA depolymerases, **Auxiliadora Prieto**, Biological Research Institute Margarita Salas (CIB), Spain
- 11:35 – 11:45 Developing bioengineered polyhydroxyalkanoate (PHA)-producing microbial chassis for PET plastic bio-upcycling, **Ahmad Bazli Ramzi**, Universiti Kebangsaan Malaysia, Malaysia
- 11:45 – 12:05 Keynote lecture: Enhanced adhesion promoter peptides for plastic degradation, **Yu Ji**, RWTH Aachen University, Germany
- 12:05 – 12:15 On the non-catalytic role of lytic polysaccharide monooxygenases in boosting the action of PETases on PET polymers, **Thamy Correa**, University of York, United Kingdom
- 12:15 – 12:35 Keynote lecture: **Cristiano Varrone**, Aalborg University, Denmark
- 12:35 – 12:45 Reuse of agrifood and footwear wastes in the development of bioplastic 3D packaging, **Carolina Martins**, CICECO - Aveiro Institute of Materials, University of Aveiro, Portugal
- 12:45 – 12:55 Industry perspective: Sugar beet paper, **Markus Giesen** and **Timo Koch**, Pfeifer & Langen, Germany

13:00 – 13:30 *break*

Session 3: Plastic recycling and environmental impact of discarded plastics

Chair: **Auxiliadora Prieto**, Biological Research Institute Margarita Salas (CIB), Spain

Session co-organised by the Biobased Materials Division of the European Federation of Biotechnology

- 13:30 – 13:35 Introduction: **Auxiliadora Prieto**, Biological Research Institute Margarita Salas (CIB), Spain
- 13:35 – 13:55 Keynote lecture: Soil-derived microbial consortia and their potential to transform plastics, **Diego Javier Jiménez Avella**, KAUST, Saudi Arabia

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- 13:55 – 14:05 One-pot biosynthesis of acetone from waste poly(hydroxybutyrate), **Benjamin Armijo Galdames**, University of Edinburgh, United Kingdom
- 14:05 – 14:25 Keynote lecture: **Ren Wei**, Universität Greifswald, Germany
- 14:25 – 14:35 Biotechnological treatment of polyethylene terephthalate mixed plastic streams, **Jeovan Araujo**, Technological University of the Shannon Midlands Midwest, Ireland
- 14:35 – 14:45 Plastic upcycling by mycelium-based materials, **Onur Kirdök**, Biopbiotech, Turkey
- 14:45 – 15:05 Keynote lecture: **David Meier**, University of California, Berkeley, USA

15:10 – 15:30 *break*

Session 4: Plastic recycling and environmental impact of discarded plastics

Chair: **Joana Pereira**, University of Aveiro, Portugal

Session co-organised by the Environmental Biotechnology Division of the European Federation of Biotechnology

- 15:30 – 15:35 Introduction: **Joana Pereira**, University of Aveiro, Portugal
- 15:35 – 15:55 Keynote lecture: Plastic weathering and contaminant transport within the environment, **Maryam Salehi**, Herff College of Engineering, USA
- 15:55 – 16:05 Effect of microplastic ageing on glyphosate sorption and toxicity, **Anna Parus**, Poznan University of Technology / Institute of Chemical Technology and Engineering, Poland
- 16:05 – 16:25 Keynote lecture: **Jana Asselman**, Ghent University, Belgium
- 16:25 – 16:35 Dissecting xenobiotic interactions in aquatic environment vulnerable to the presence of microplastic, **Natalia Lisiecka**, Politechnika Poznańska, Wydział Technologii Chemicznej, Instytut Technologii i Inżynierii Chemicznej, Poland
- 16:35 – 16:55 Keynote lecture: **Miguel Oliveira**, University of Aveiro, Portugal
- 16:55 – 17:05 Microplastics occurrence in biosolids, **Zuzanna Prus**, AGH University of Cracow, Poland
- 17:05 – 17:15 Volatile fatty acids production from bioplastics: a new opportunity to create a closed-loop bioplastics supply chain, **Octavio Garcia Depraect**, University of Valladolid, Spain