ABSTRACT BOOK

SETAC EUROPE 34TH ANNUAL MEETING

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SCIENCE-BASED SOLUTIONS IN TIMES OF CRISIS: INTEGRATING SCIENCE AND POLICY FOR ENVIRONMENTAL CHALLENGES.

Abstract Book

SETAC Europe 34th Annual Meeting

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This book compiles the abstracts from the 34th annual meeting of the Society of Environmental Toxicology and Chemistry – Europe (SETAC Europe), conducted from 5–9 May 2024 in Seville, Spain.

The abstracts are reproduced as submitted by the author and accepted by the scientific committee. They appear in order of abstract code and alphabetical order per presentation type. The poster spotlight abstracts are included in the list of poster abstracts. The presenting author of each abstract is highlighted in bold.

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Society of Environmental Toxicology and Chemistry Europe (SETAC Europe)

environmental advantages of chemical recycling, specifically pyrolysis. Using Life Cycle Assessment (LCA), we examine a scaled-up industrial process for the pyrolysis of sorted waste PP (wPP), considering two perspectives: waste treatment and propylene production. Energy integration, utilizing pinch methodology, addresses the process's energy intensity. The LCA, utilizing SimaPro with Ecoinvent v3.7.1 and ReCiPe Endpoint (H) V1.1 impact categories, assesses the cradle-to-grave scope. The first perspective analyzes pyrolysis as a waste treatment process, comparing it with incineration and landfilling, using 1 kg of wPP as the functional unit. Products obtained are considered avoided, and incineration heat serves as environmental credit. The second perspective evaluates pyrolysis as a propylene production process, comparing it with the business-as-usual (BAU) route. The functional unit is 1 kg of propylene, with credits for avoided wPP treatment. Results show positive attributes of pyrolysis in impact categories (human health, ecosystems, resources) due to environmental credits. Propylene and 1-butene exhibit the most positive influence. Incineration credits contribute to positive impacts. Landfilling poses threats to human health but minimal damage to ecosystems and resources. Comparing BAU propylene production with pyrolysis illustrates the latter's environmental advantages, even without considering credits. In conclusion, pyrolysis of waste PP proves a promising closed-loop alternative with environmental benefits. Further research into techno-economic aspects is warranted for widespread implementation.

5.06.P-We446 The Importance of Material Flow Analysis for Life Cycle Assessment of Microplastics

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Plastic pollution is a complex environmental problem that has gained interest from numerous fields of study. Given the persistence of plastic pollution in environmental compartments, impact assessment has become increasingly relevant. However, in order to carry out a comprehensive and holistic impact assessment using Life Cycle Impact Assessment (LCIA), the flows of plastic to and through environmental compartments must be understood. The challenge, however, is rooted in the inherent complexity in attempting to map plastic pollution sources and leakage pathways. It becomes increasingly clear that interdisciplinary work is required to accurately map plastic pollution. Therefore, we demonstrate the benefits of using material flow analysis (MFA) to populate the life cycle inventory (LCI) phase of LCA. By combining these methods, we were able to carry out an MFA of macro- and microplastic pollution from geotextiles, dollyropes and mulch film as well as a simplified LCIA of microplastics released from mulch film. The use of MFA allowed us to better understand macro- and microplastic leakage from relevant materials as well as highlight critical data and knowledge gaps that should be addressed in future research.

5.06.P-We447 The Life Cycle Inventory of an Innovative Biorefinery for Polyhydroxyalkanoates Production

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Petroleum-based plastics carry undoubted environmental burdens, thus, alternatives to fossil feedstock are sought. Biobased and biodegradable polymers, such as polyhydroxyalkanoates (PHAs), appear as a valuable substitute for conventional plastic. However, their environmental preferability over fossil plastics is greatly conditioned by the production process, whose high cost also hinders their market penetration. To be viable, solutions must consider both the cost and the environmental aspects. To overcome these challenges, an innovative PHA production process is proposed by the Horizon Europe-funded BioLaMer project, based on the valorization of food waste, through the food-eating black soldier fly larvae (BSFL, *Hermetia illucens*). The invariable chemical composition of the larvae constitutes a novel high-impact feedstock for the cost-effective production of PHAs and chitosan biopolymers. Life Cycle Assessment (LCA) is conducted from the very beginning of the proof of principle stage, to ensure the environmental sustainability of this innovative biorefinery and to provide a final product which is safe and sustainable by design. The project started in April 2023, and after the goal and scope definition, the Life Cycle Inventory (LCI) is now under development. Firstly, the main steps of PHA production will be here illustrated. The manufacturing process starts with the food waste to BSFL conversion, in a self-supporting larvae cultivation plant. Then, the BSFL exoskeleton is separated - for chitin extraction - from the protein and lipids fractions. These will be converted into PHAs through biorefinery. At the moment, various biopolymer synthesis pathways are trialed, comprehending both pure and mixed media cultures. As an accurate LCI is of primary importance to obtain reliable and strong conclusions, our first aim is to obtain a complete qualitative LCI comprising data on single-operation unit processes to the greatest extent, while minimizing black box unit processes. This not only allows easier reviews but also avoids multifunctionality problems as much as possible. Furthermore, while the quantitative data will vary as the production process is optimized, a detailed qualitative LCI is already relevant at this stage, to verify if available datasets exist for background processes. Moreover, it is also an essential base for the upscaling process, where lab-scale processes will have to be converted to pilot-scale plants.

5.06.P-We448 Life Cycle Assessment of the Electron Beam-Assisted Production of Thermoplastic Elastomers Based on Recycled Polyethylene and Polypropylene Waste

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Increasing production rates of rubber products combined with a lack of effective recycling methods have led to an exponential growth of rubber waste in landfills and incineration, inducing severe environmental problems. Due to the crosslinking of