

Opportunities and challenges for plastic recycling

Session organizer:

Jun Nakatani (The University of Tokyo, Japan)

Aim and scope

Plastic production and consumption are increasing worldwide. Plastic products, in particular single-use plastics, impact the environment over their life cycles not only by entering the ocean but also by influencing climate change through greenhouse gas emissions from production to waste treatment. There have been wide-ranging discussions regarding approaches to solve and alleviate such problems, including the reduction and recycling of plastics. To reduce plastic usage and increase the amount of recycling, it is essential to quantitatively identify who uses and discards what types of plastics. Moreover, as the demand for recycled resin produced by mechanical (or material) recycling is constrained by quality deterioration and contamination by foreign substances such as plastic additives, recently chemical (or feedstock) recycling is attracting attention around the world.

In this organized session, three topics including seven studies will be presented. First, emerging technologies and environmental implications of chemical recycling are discussed. Second, input-output modeling is applied to reveal material flows and environmental impacts of plastic packaging as typical single-use plastics. Furthermore, a substance flow study and a comprehensive database are presented for plastic additives including brominated flame retardants.

Session keynote

Dr. Martin Baitz (Senior Life-Cycle-Sustainability Expert, Sphera Solutions GmbH)

Biography: Martin Baitz graduated in Chemical Engineering (PhD) and until 2002 he was Research Engineer and Head of Department at the LCA-Department IKP at University of Stuttgart. From 2003 until 2010 he was Director Process and Material Sustainability at PE INTERNATIONAL, Germany working as Consultant mainly in the Chemical, Plastics and Automotive industry. From 2011 to 2019 he was Director Content at thinkstep AG, responsible to develop and maintain the GaBi Databases for Life-Cycle Assessment and Sustainability applications. Since 2020 he is responsible for Quality Assurance, Innovation and thought leadership of the GaBi

Databases and Content at Sphera and an Expert for Critical Reviews. He is member of German LCA standardisation body AA3 of DIN- ISO, Co-Editor of the International Journal of Life-Cycle Assessment for Data Quality and Availability and Associate Lecturer for Life Cycle Assessment at University of applied sciences Esslingen. Martin Baitz is consulting the European Commission DG Environment, DG Energy and DG Joint Research, is member in the Society for Environmental Toxicology and Chemistry (SETAC) and in the Forum for Sustainability through Life Cycle Innovation.

Presentations

Topic 1: Emerging chemical recycling of plastics

- [Session keynote] Chemical recycling: LCA applications and implications from EU perspective
Martin Baitz (Sphera Solutions GmbH, Germany)
- [Invited] Latest trends and challenges in feedstock recycling technologies for waste plastics
Shogo Kumagai (Tohoku University, Japan)

Topic 2: Input–output modeling for plastic packaging

- Input–output modeling for the intersectoral material flow of plastic packaging in Japan
Jun Nakatani (The University of Tokyo, Japan)
- Plastic packaging in the EU from production to waste management and back again
Ciprian Cimpan (NTNU, Norway)
- Greenhouse gas emissions reduction potential of Taiwan's plastic packaging circulation goals: scenario analysis based on waste input–output modeling
Chang Chien (NCKU, Taiwan)

Topic 3: Plastic additives as constraints for recycling

- Revealing bromine flame retardants flow in Japan with input–output approach
Mayu Sasaki (Tohoku University, Japan)
- A comprehensive plastics additives database and its potential application for plastics recycling scenario investigation
Magdalena Klotz (ETH Zurich, Switzerland)

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