Advanced Recycling Conference - Conference abstract

Topic: Challenges in LCA of Chemical recycling of plastic waste

Abstract:
Chemical recycling offers a vital pathway for difficult-to-recycle plastics that would otherwise be disposed of. Recovering this waste keeps valuable resources in circulation. However, quantifying its environmental impacts via life cycle assessment (LCA) presents significant methodological challenges. The primary obstacle is handling the process's inherent multifunctionality, as chemical recycling treats waste and produces new materials. Consequently, a major challenge lies in choosing an appropriate scope and angle when comparing chemical recycling to an alternative reference system.

Practitioners face multiple modeling options, such as comparisons against end-of-life waste treatment options, alternative production routes for plastics or other materials, or a full system-level approach (e.g. closed-loop life cycle). Determining the appropriate option depends entirely on the study’s objective and intended audience, as there is no single universally ideal method to calculate the LCA of chemical recycling.

Because the chosen angle inherently dictates the system boundaries, the required life cycle inventory data, and the substitution or allocation methods used, the LCA results vary across different scopes. Consequently, generalising the impact of chemical recycling remains a challenge. To ensure transparency and enable fair comparisons of these circular solutions against conventional linear systems, there is an urgent need to develop and adopt generally agreed upon and accepted impact accounting methods for chemical recycling.