Abstract talk Michael Sander – Renewable Material Conference 2026

From Fundamentals to Function: Scientific Insights into Polymer Biodegradation

Biodegradability is increasingly recognized as a key safe-and-sustainable-by-design criterion for polymeric materials. Demonstrating the microbial conversion of polymers is essential for preventing the accumulation of persistent plastics and their transformation products in natural and engineered environments. However, important scientific questions remain regarding the fate of polymer carbon during biodegradation and the interpretation of results from conventional biodegradation tests.

This contribution highlights how the combination of stable carbon isotope-labeled polymers and residual polymer analysis can advance our understanding of biodegradation processes by enabling direct tracking of polymer carbon across all relevant pools, including residual polymer, CO_2, and microbial biomass. These approaches allow carbon mass balances to be closed and provide unique insights into the mechanisms and fate of polymer biodegradation, thereby strengthening the scientific basis for biodegradability assessment.

Beyond presenting fundamental research, the contribution will discuss how these emerging methodologies are gaining relevance in a regulatory context. As demands for robust evidence of polymer biodegradability continue to grow, isotope-based approaches can support the development of more reliable assessment frameworks. By linking detailed carbon fate analyses with biodegradability testing, these tools help bridge fundamental scientific understanding and regulatory decision-making, supporting the development of truly sustainable polymeric materials.