

Title: An analytical toolbox to qualify and compare recyclates

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Abstract:

Note: maximum length of 400 words.

Polyolefins are by far the most relevant class of synthetic polymers, and thus contribute a large share of used plastics. The composition of virgin plastics (polymer type, additive package, fillers) is well known due to the history of synthesis and compounding, and the status is routinely checked using state-of-the-art analysis protocols. Major analytical research efforts have been focussing on molecular architecture recently. Post-industrial streams are also quite well-defined, having gone through a single cycle of conversion. Post-consumer recyclates, on the other hand, are variable in their composition despite sophisticated routes of separation. Particularly, these streams may contain contaminations from their first life like residues from food, pharmaceuticals, and others. Complicating matters further, these streams are subject to seasonal and geographic fluctuations.

Within this scenario, analytical protocols are urgently needed to detect these fluctuations and evaluate the outcome of sorting and workup technologies. In the legal context, a challenge arises from national and EU-wide legislation requiring a certain percentage of post-consumer recyclates to be present in end products. Therefore, methods are urgently needed to authenticate the content of recyclate in material streams and plastic products and thus ensure compliance with the rules.

A toolbox, which enables a comprehensive molecular analysis of recyclates, in particular post-consumer materials, ranging from the polymer to the additive package will be presented. This can be used to establish structure-property relationships, which in turn serve as the basis for material and process development. In this sense, the development of analytical skills is crucial to foster the transformation towards a circular plastics economy.