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Abstract

Circularity Micro-Indicators Applied to Plastic Parts: The Materials Perspective †

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The use of polymeric materials has increased exponentially in recent decades in all application areas. However, currently, most plastic products are designed and manufactured without careful consideration of their end-of-life management. As a result, the generated waste presents a large diversity of different polymers (often including harmful additives), which are discharged in landfills, posing problems for sustainable and environmentally friendly waste management, and draining valuable finite resources.

Thus, it is urgent to change the plastic sector regarding the way products are conceived, and to promote, through strategies of the circular economy, the recovery of plastic materials to produce new products.

To make this possible, there is a need to inform plastic manufacturers about circular economy concepts and provide knowledge and tools that allow them to measure the circularity of their products. In recent years, circularity micro-indicators have been proposed as a type of tool addressing this issue; however, they vary in scope, breadth, and the perspective they take on the overall life cycle of the product. Additionally, among the plethora of such circularity micro-indicators, the materials used in the product and how the material is handled at the end-of-life stage are only relevant in some cases.

As such, this paper aims to identify circular micro-indicators that are relevant to plastic products and consider the origin of their polymeric materials (virgin, recycled, biodegradable, compostable, or derived from renewable sources) for evaluating product circularity. Within the scope of decision making, these circularity micro-indicators can help project development teams to determine if the selected materials contribute to overall product sustainability. In addition, we identify—from the materials perspective—some guidelines and good practices that help maximize product circularity and accelerate the implementation of the circular economy in the plastics sector.

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