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Bio-based and biodegradable compostable plastics: Logic, definitions and testing methods

Replacing petro/fossil carbon with bio-based carbon by using plant biomass feedstock in place of fossil feedstock for the manufacture of plastic materials offers a strong 'value proposition' for a zero material carbon footprint. It may also reduce the process carbon and environmental footprint. A methodology for quantification of 'bio-based carbon content' has been developed and codified into the ASTM Standard D6866. Using bio-based carbon content calculations, one can calculate the intrinsic CO₂ reductions achieved by incorporating bio-based carbon content into a plastic product - the material carbon footprint. It is important to report on the process carbon footprint (process footprint arising from the conversion of feedstock to product) using lifecycle assessment methodology to ensure that the intrinsic material carbon footprint value proposition is not negated during the conversion, use, and disposal lifecycle phases of the product. Biodegradability is an end-of-life option for single-use disposable plastics and needs to be tied to a disposal environment such as composting (compostable plastic) or soil or anaerobic digestion. More importantly, if a biodegradable plastic is not completely and rapidly removed (within not more than 1-2 years) from the target disposal environment, the degraded fragments become toxin carriers, resulting in serious environmental and health risks. ASTM, European, and ISO standards define and specify the requirements for complete biodegradability in composting, soil, and marine environments and must be strictly adhered to so that serious environmental and health consequences can be avoided.

Biography

Ramani Narayan is University Distinguished Professor, the highest honor that can be bestowed on a faculty member at Michigan State University. He is Fellow of the US National Academy of Inventors; Fellow of ASTM & received ASTM award of merit, the highest award given by the society to an individual member. He is Scientific Chair of the Biodegradable Products Institute (BPI) USA; and Convener/Technical Expert on several ISO Standards committees. He has 200 refereed publications, 30 issued patents and supervised 20 PhD and 25 Master's students. He is a successful Entrepreneur, having commercialized several bioplastics technologies.

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