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Innovation trend on sustainable bioplastics: The case of furanoate

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In order to be sustainable, a polymer has to follow eight criteria, which blend sustainable objectives, business consideration and environmental concerns related to their life cycle. One of these criteria imposes that source, manufacture, transportation and recycle, by using renewable energy. In this view, practically no sustainable polymers are present on the market today. The great and growing interest in sustainability is driving the development of "biobased" materials, i.e. obtainable from renewable sources, which could be or not biodegradable and that are characterized by minimum waste production, transport efficiency and controlled after-use disposal and/or recycling. Taking into consideration that poly(ethylene terephthalate) (PET) dominates the packaging scene, due to its competitive chemical-physical, barrier and mechanical performance-to-cost ratio, the interest of researchers and industry is surely versus biobased PET-like polyesters. Considering the actual scenario, in particular, the academic as well as industrial interest is oriented to i) find biosourced alternatives to produce PET reducing petroleum dependence and carbon dioxide emissions, and ii) synthesize new polyesters produced from 2,5-furandicarboxylic acid as monomer.Poly(ethylene 2,5-furandicarboxylate) (PEF), due to its similarity with the well-known poly(ethylene terephthalate) (PET), is one of the most promising renewable-based polyesters, with chemical, thermal, and mechanical properties very similar to those of PET, which renders it a reliable alternative to this latter polymer. In particular, PEF exhibits significantly improved barrier properties compared to PET: in specific, amorphous PEF exhibits an 11X reduction in oxygen permeability, a 19X reduction in carbon dioxide permeability, and a 2.1X reduction in water permeability as compared to amorphous PET. Accordingly, very recently, Avantium produced to the industrial scale PEF bottle for soft drinks, water, and alcoholic beverages. Poly(alkylene 2,5-furandicarboxylate)s can be therefore potentially considered a genuine alternative as sustainable bioplastics, but more research has to be performed to assess their environmental impact through the life cycle analysis (LCA) study.

Biography

Valentina Siracusa was graduated in Industrial Chemistry at University of Catania (Italy). She completed her PhD and post-PhD study working on the synthesis and characterization of innovative polyesters. From 2006, she is Associate Professor in Chemistry for Engineering at Catania University. She collaborates to European Projects on several researches such as recycle, ambient, food packaging, and graphene. Actually, she collaborates with national and international research groups on biopolymers materials used in the food packaging field, with also Lyfe Cycle Assessment study. She is author of more than 70 publications and guest editor of international journals.

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