

Sustainability for polymeric fibers and textiles

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Abstract:

Polymeric fibers and textiles are essential to humans not only as clothing but also in a wide variety of technical applications such as medical, construction, agriculture etc. Bringing many societal, and technological benefits, they have become indispensable materials in our lives. However, the speed at which they end up in landfills poses a severe risk to the environment and requires the textile chain focus on sustainability.

Research on the sustainability for polymeric fibers and textiles has focused mainly on design for sustainability, use of sustainable sources, and recycling. Design for sustainability is a holistic approach to the activities that prioritize the environment and aims to reduce the negative impact of design on the environment. Being materials derived from renewable, recycled and waste carbon resources and their combinations, which at their end of life can be recycled, biodegraded, or composted, sustainable polymers can contribute to tackle the problem of the depletion of fossil reserves, which is one of the most substantial challenges of our near future. Recycling, on the other hand, stands as an end-of-life option, which makes it possible to preserve the value generated. It enables the reintroduction of materials into the manufacturing thereby reducing the reliance on petroleum-based raw materials, CO₂ emissions, energy consumption, the amount of waste disposal, and the environmental pollution by landfilling.

Globally, approximately 75% of textile waste is disposed of in landfills, 25% is reused or recycled, and less than 1% of all textiles is recycled back into clothing. Considering the environmental problems and continuously increasing demand for textiles, there is an urgent need for new innovative recycling methods. The ISOPREP project has officially joined the fight against plastic pollution, with a green solvent-based chemical recycling technology to recover virgin quality polypropylene from end-of-life waste carpets. This study is intended to provide an overview about the environmental problems related with the disposal of plastics and specifically polymeric fibers and textiles, current state-of-the-art on the efforts to improve the sustainability for polymeric fibers and textiles, and the concept of the ISOPREP project.

Keywords: Circular economy, environment, plastics, polymer, recycling, sustainability, textiles.

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Biography:

Holding B.S. and Ph.D. degrees in Chemistry, Dr Unal has a broad industrial and academic research experience on the synthesis, characterization, processing and structure-property relationships of polymeric materials and their nanocomposites. In his research, Dr. Unal has specifically focused on enhancing interfacial interactions between dissimilar components of hybrid composite structures by chemical means. During his industrial research career in USA at Bayer Material Science LLC, Dr Unal was responsible for the development, upscaling and commercialization of new polyurethane coatings, elastomers, and thermoplastics. Since joining SU in 2012, Dr Unal has been granted the Marie Curie CIG Award (FP7-PEOPLE-2012-CIG/CNT-in-FRPC) for a project titled “Tailor-Made Bi-functional Carbon Nanotubes to Enhance Interfacial Interactions In Fiber Reinforced Polymeric Composites” and completed,

which focused on the development of novel, chemically functional nanomaterials for tailored interfacial interactions in fiber reinforced polymeric nanocomposites. Dr Unal has co-authored more than 20 scientific publications, 4 granted international patents, 8 patent applications, numerous conference presentations. In addition, he is the co-founder and the chairman of a spin-off company, Punova R&D Chemicals, focused on pilot and industrial scale chemical manufacturing of new materials developed at SU.