



Development a methodology for early estimation of the recycled polypropylene fibers photo degradation

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Abstract

Polypropylene becoming the most widespread plastic in the world due to its resistance to the most of aggressive substances, high durability, low sensitivity to microorganisms, while these characteristics of the polymer remain at high humidity. All these properties contribute to the continuous expansion of polypropylene applications from packaging materials to mechanical engineering and construction. However, according to the American Chemicals Council, polypropylene is rare recyclable plastic due to its fibers destruction during landfilling and recycling. A degradation process manifests in the weakening of chemical bonds and breaking of macromolecules, which ultimately reduces the mechanical and strength properties of the polymer. According to the literature review, there is a lack of knowledge in studying degradation of recycled polypropylene fibers into the landfill conditions. This research has to cover this gap. We model the environmental conditions of polypropylene degradation and study its structural characteristics with FTIR spectroscopy. All pieces of clean and dry plastic flakes were studied before installation to the test bench and compared to the spectra after. The difference in spectra shows the beginning of degradation process inside the polypropylene fibers. It demonstrates that the optical methods could detect the degradation of the polypropylene on the early stage. Based on this data following research is proposed - development of a technology for quality improvement of recycled polypropylene fibers by extracting the most degraded samples from the production cycle. It has to increase the quality of recycled polypropylene fibers.

Biography:

Andrey Pimenov was graduated from Skolkovo Institute of Science and Technology (Skoltech) of Advanced manufacturing and product design program in December of 2016. During this period of time he has an internship in Massachusetts Institute of Technology (MIT). He was a lead control system engineer in the space manufacturing project in Russia 2016 – 2018. Andrey entered PhD program of Engineering Systems in Skoltech in November 2018.