



METADATA

Title: Polymer Recycling

Other Titles: -

Language: Greek

Authors: Achilias, D., Professor, Καθηγητής, AUTH

ISBN: 978-618-5667-69-6

Subject: NATURAL SCIENCES AND AGRICULTURAL SCIENCES, ENGINEERING AND TECHNOLOGY

Keywords: Polymers / Plastics / Recycling / Wastes / Pyrolysis

Bibliographic Reference: Achilias, D. (2023). Polymer Recycling [Monograph]. Kallipos, Open Academic Editions. <http://dx.doi.org/10.57713/kallipos-116>

Abstract

This book presents in a complete and thorough way the issue of plastics recycling, emphasizing the variety of products that can be derived from it. Initially, quantitative and qualitative characteristics of plastic waste are given, together with the main types of polymers in plastic waste and the necessity of recycling plastics as well as the problems that make it difficult to recycle them on a large scale. Then, methods are developed for sorting different types of polymers from a mixture of plastic waste, such as manual sorting, flotation, the use of near-infrared (NIR) spectroscopy etc. The main body of the book includes an extensive description of the various methods that have been proposed for recycling plastics. In particular, mechanical recycling methods such as melting/reforming and selective dissolution/precipitation are described. Comprehensive examples of mechanical recycling of various types of plastics, such as PET and PVC, are given. Subsequently, a detailed description is given of the chemical recycling of plastics with an emphasis on the three major categories of

polymers, i.e. polyesters (PET, PC, PLA), polyamides (Nylon) and polyurethanes and the products obtained depending on the process followed. The methods of thermo-chemical recycling of plastics are developed with special emphasis on pyrolysis and catalytic pyrolysis of various polymers (such as polyethylene, polypropylene etc.) and briefly on gasification and hydro-pyrolysis. The recovery of energy from plastic waste is also presented by combustion/incineration technologies and the potential environmental issues raised by the emission of hazardous substances. Finally, integrated methods of recycling various categories of plastic waste are presented, such as packaging materials, waste electrical and electronic equipment, and end-of-life vehicles, including tires. Reference is made to topics of particular environmental interest today, such as microplastics, single-use plastics, the existence of high-risk compounds in plastic waste, the recycling of multilayer films etc., in order to highlight the contribution of plastic recycling to the transition from linear to the circular economy.

