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Aims and Scope

The series presents critical reviews of the present and future trends in polymer and biopolymer science including chemistry, physical chemistry, physics and material science. It is addressed to all scientists at universities and in industry who wish to keep abreast of advances in the topics covered.

Review articles for the topical volumes are invited by the volume editors. As a rule, single contributions are also specially commissioned. The editors and publishers will, however, always be pleased to receive suggestions and supplementary information. Papers are accepted for *Advances in Polymer Science* in English.

In references *Advances in Polymer Sciences* is abbreviated as *Adv Polym Sci* and is cited as a journal.

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Preface

The majority of the polymers in use today have been developed within the last 60 years. A large proportion of these are synthetic products, which basically means that they are prepared from simple technical monomers. Their principal advantages are light weight, high impact and tensile strengths, resistance to corrosion, salt water and most chemicals, as well as suitability for use over a wide range of temperatures. The various possibilities to fine-tune their properties for plentiful applications have resulted in continuously growing polymer production of the last years.

Besides some smaller applications as materials for electronics or automotives, polymers are mainly used in construction (21%) and as packaging materials (38%). The latter is a comparably short-term application which causes a disposal problem due to the longevity and undefined environmental fate of the materials. For this reason, waste management of polymers is of high interest. Waste disposal sites only shift the problem and cause new environmental concerns [1]. Accordingly, administrations generate new regulations in order to avoid such environmental pollution. For example, the European Union has restricted the amount of polymeric materials designated to landfill. Each member state has to reduce 65% of this volume of waste by July 2016 and find alternative recovery methods [2]. Recycling of polymeric products, however, is extremely cost-intensive [3] and is hindered by the use of non-mono-material products [4]. Utilization of the high intrinsic fuel value by waste combustion does not solve the problem due to pollutant emissions and residues that need to be disposed of as hazardous waste [5]. Therefore, one elegant way to deal with this problem is the use of biodegradable representatives especially in short-term applications such as packaging, foils, and utilities in agriculture.

Biodegradable polymers are macromolecules mainly derived from renewable sources, which can be enzymatically or hydrolytically degraded into low molecular parts. These parts can be reabsorbed by microorganisms, which ideally convert them to CO_2 and water heading to an environmentally closed circular flow economy between growing of nutrients, production, utilization, and material recycling (Fig. 1).

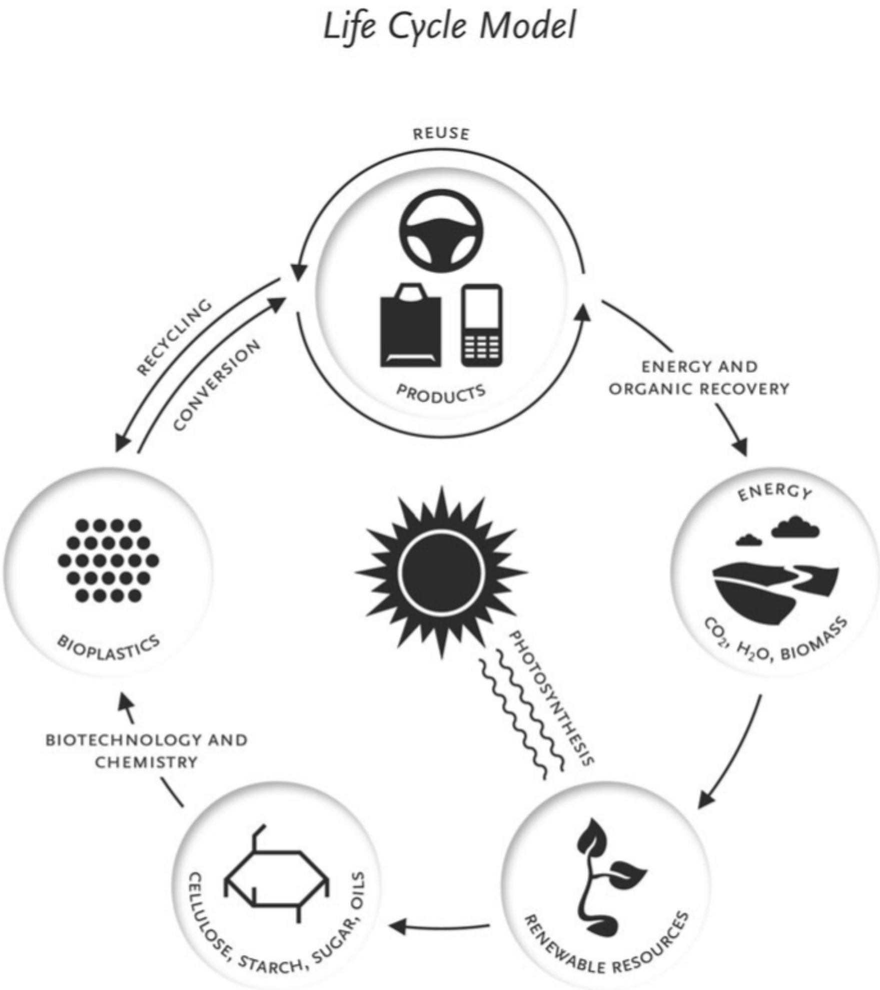

Fig. 1 Life cycle model of biorenewable polymers according to European Bioplastics [6]

In the recent years, new markets have arisen for biodegradable polymers such as poly(butylene adipate-terephthalate), poly(lactide), poly(butylenesuccinate), or poly(3-hydroxybutyrate) and poly(carbonates). They constitute a new class of "green polymers" with wide application potential for packaging, clothing, carpets, applications in automotive engineering, foils, and utilities in agriculture.

Herein we present the latest results and developments in this field. In our opinion, current trends are promoted by both academic research and industrial developments. Therefore, we decided to present a combination of both perspectives within this volume.