



## Book Reviews

**Agricultural and Synthetic Polymers Biodegradability and Utilization.** Edited by J. E. Glass and G. Swift, American Chemical Society, Washington DC, 1990. 330 pp. ISBN 0 8412 18161. Price \$69–95.

Polymeric materials have been developed to be physically and chemically stable and resistant to microbial attack. This has often been achieved not only by optimization of the polymer type and molecular weight, but also by the addition of ultraviolet and heat stabilizers and antioxidants during the manufacturing process. However, the subsequent problems of disposal of this exceptionally stable solid waste is difficult. Often the only available method is through the wide spread use of landfill sites which are limited in both number and size. Inevitably the widespread use of plastics in commodity packaging and speciality polymers has resulted in discord between the polymer industry and the environment. This has resulted in the need to develop alternative polymeric products which will be stable during their period of use but can subsequently be biodegraded.

The book title discusses two alternatives currently available to the polymer industry to address this environmental issue; the possibility of biodegradation of synthetic polymers and the alternative use of natural renewable monomers and polymers. The first five chapters are a series of overviews with chapter one giving both an historical perspective and an outline of the recent developments in the production of environmentally degradable polymers and plastics. The degradation pathways, types of polymers which are presently utilized and the difficulties of currently available test protocols for degradability are all covered in this opening overview. It sets the scene and puts into perspective the problems currently facing the industry. One approach to the problem is detailed in chapter two which proposes a multi-disciplinary approach to the biodegradation process of biological waste treatment. This total system approach, combining science and engineering is presented as significantly improving the efficiency of degradation. The third chapter explains the possible use of insect symbionts as possible sources of the detoxifying enzymes for waste treatment. This section of the book is concluded with two overviews which address economics of plastic recycling and disposal

and the inertia to new products or methods of disposal. The next ten chapters cover the degradability of commodity and speciality polymers by presenting the results of specific research projects and case studies. These will be of particular interest to the polymer technologist.

The section dealing with the use of natural renewable sources of polymers which would be expected to exhibit improved biodegradability is opened with a discussion on mono and disaccharides which could be utilized to produce polymers with the necessary chemical and physical characteristics but which would be degraded in the environment. Both this chapter and the following one which looks at polymers and oligomers containing furan rings, propose the use of starting materials which can be obtained from what is currently termed 'the biomass'. Often these are in the form of inexpensive byproducts from an existing industry. In addition to obtaining monomers and polymers from the biomass, it is also possible to use micro-organisms to produce polymeric materials for industrial use. An example of a bacterial production of a polysaccharide, fructan, is presented in the next chapter. The isolation of a levan producing bacterium and characteristics of the fructan it produces are presented. This is followed by seven chapters which present specific examples of the use of polysaccharides and modified polysaccharides as commodity or speciality polymers.

This book presents approaches which can be taken to reduce the environmental problem of plastic/polymer pollution through production of synthetic polymers which are biodegradable and also the use of natural renewable sources of monomers and polymers. In both areas, examples are given of current technology where materials have been produced which can be used either as commodity plastics or speciality polymers. It should be of interest not only to those people actively involved in the development of new products within the polymer industry, but also to individuals who are interested in environmental issues, in particular the way in which current technology can be utilized to reduce the impact of pollution on the environment.

Linda L. Lloyd  
John F. Kennedy