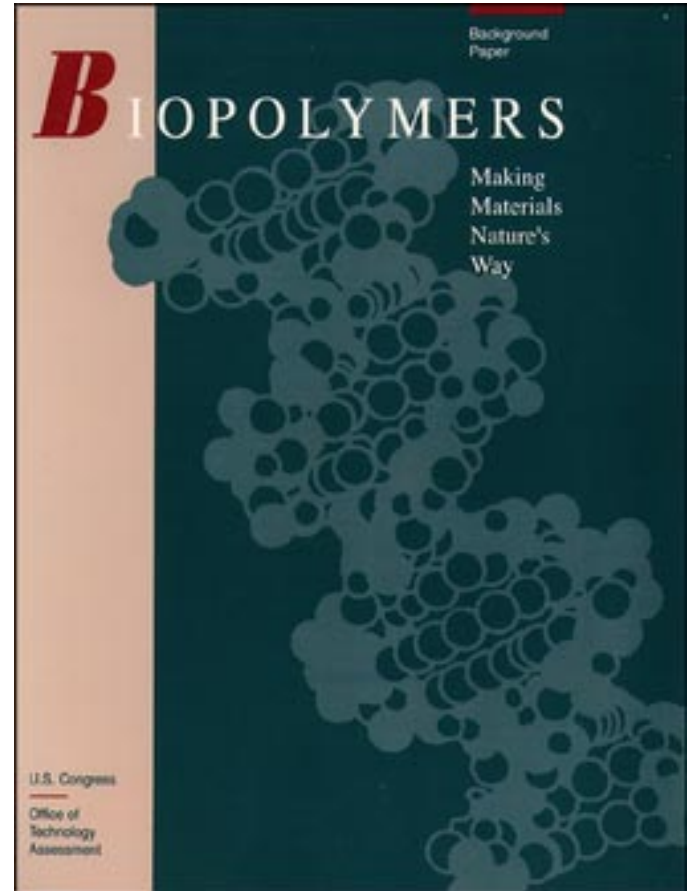


*Biopolymers: Making Materials Nature's Way*

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# Foreword

Over the past century, global economic activities have increased more than fifty-fold. This extraordinary growth has raised serious concerns about current patterns of production and consumption. As society has increased its understanding of the environmental implications of its industrial practices, greater attention has *been* given to the concept of sustainable economic systems that rely on renewable sources of energy and materials. The use of biologically derived polymers—biopolymers—could emerge as an important component of this new paradigm of economic development.

By transforming agricultural or marine feedstocks, or harnessing the enzymes found in nature, a new class of renewable, biodegradable, and biocompatible materials is being introduced. Emerging applications of biopolymers range from packaging to industrial chemicals, to medical implant devices, to computer storage media. In addition to producing “green” materials with unique physical and functional properties, the processes used to create biopolymers could lead to new manufacturing approaches that minimize energy consumption and waste generation.

As the United States and other countries address a growing list of environmental problems, the possibility of using proteins, carbohydrates, and other biopolymers to meet the materials requirements of an expanding economy is likely to receive increasing attention. However, as with other nascent technologies, difficult engineering and economic hurdles stand in the way of biopolymer commercialization efforts. With its current areas of emphasis, the extensive U.S. public investment in agricultural science and biotechnology can only be expected to provide modest assistance in overcoming some of these barriers. Advances in biopolymer technology have been driven principally by industry and academia, with Federal programs being relatively limited in scope. Because biopolymers have applications in many different sectors of the economy, their widespread use could have important competitive implications. At present, Japan and the European Community are sponsoring major programs in biopolymer science and manufacturing. Due to the potential importance of biopolymer technology, the Federal role in this interdisciplinary field warrants closer scrutiny.

This Background Paper was requested by the Senate Committee on Energy and Natural Resources. The study provides a basic introduction to biopolymer technology; profiles some of the more promising polymer materials; reviews research activities in the United States, Europe, and Japan; and describes the principal technical challenges and regulatory issues that may affect biopolymer commercialization efforts.

OTA appreciates the assistance provided by its contractors and the many reviewers whose comments helped to ensure the accuracy of the study.



Roger C. Herdman, Director

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