
Preface

Sustaining the demand for raw materials to meet the needs of future generations will be one of the most challenging tasks for human kind. In addition, complying with the increasing stringent international protocols related to climate change and exploiting of natural resources will also increase the burden on the supply of raw materials and production of commodities. Future conflicts within and between nations are more likely to be on owning or sharing of natural resources rather than ideological differences or technological prowess. Meeting the three basic necessities, food, clothing, and shelter, will be a challenge to the future leaders, especially in the overpopulated and developing countries. Rapid urbanization and consequential decrease in the availability of land and other resources required for agricultural production will put tremendous burden on the availability of food, fuel, fibers, and other basic commodities. The price and availability of fibers produced from petroleum resources that currently are predominant over natural fibers will also be in question due to depleting sources of fossil fuels. Since fuel needs have priority over fiber production, it will be imperative to find alternative sources of raw materials for fiber production.

Maximizing the use of natural resources, reducing consumption, and recycling are some of the possible approaches to meet the future demands for fibers, textiles, and other commodities. Agricultural production inevitably generates by-products (residues) such as stovers and straws that currently have limited applications. Similarly, processing of cereal grains generates coproducts containing proteins and carbohydrates that are mostly used for low-value applications such as animal feed. These agricultural by-products and coproducts could be used to produce fibers, thereby eliminating the need for dedicated fiber crops that require land, water, and other natural resources. These agricultural by-products and coproducts are renewable and biodegradable. Materials developed using these resources will therefore be more environmentally friendly than growing natural fibers or manufacturing fibers from petroleum. Similar to developing fibers from agricultural by-products and coproducts, other sources such as nontraditional silk worms, microorganisms, and bio- and nanotechnology could be used to develop fibers and reduce/eliminate the need for dedicated fiber crops or petroleum resources.

This book is an effort to present the potential, structure, properties, and applications of fibers that are derived from unconventional sources. The innovative biofibers described in this book are not only derived from renewable and sustainable resources but also do not need exclusive land, water, or other natural resources. Although it would be quite futuristic to think of replacing natural cellulosic fibers such as cotton, protein fibers such as silk, and synthetic fibers such as polyester, this book provides insights into potential addition to these fibers. We hope that textile professionals and academics will find this book useful and attempt to develop and use the innovative fibers in the near future.

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