



Industrial Applications of Nanocellulose and Its Nanocomposites

[S. M. Sapuan](#) (Editor), [M. N. F. Norrahim](#) (Editor), [R. A. Ilyas](#) (Editor)

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Preface

Industrial Applications of Nanocellulose and Its Nanocomposites provides an extensive, up-to-date overview of this fast-moving area of study from the perspectives of prominent researchers in academic, industrial, and government or private research laboratories. This is an exciting time to be in as, moving beyond scientific curiosity, nanocellulose is starting to hit the marketplace. Nanocellulose is a versatile material that is receiving a lot of attention from scientists in several fields such as automotives, composites, adsorbents, paints, coatings, medical implants, electronics, cosmetics, pulp and paper, tissue engineering, packaging, and aerogels. Current trends show that research related to recent developments of nanocellulose is increasing and covers several aspects including synthesis, surface modification, and improvement of the properties of nanocellulose, bearing in mind the targeted applications.

The objectives of this book are to reflect on recent advancements in the design and fabrication of nanocellulose and to discuss the important requirements for each application, along with the challenges that might arise. This book also includes an overview of the current economic perspectives and safety issues related to nanocellulose. The potential of nanotechnology and nanocomposites in various sectors of research and applications is promising and attracting increasing investment. For this reason, this book will benefit end users such as students, researchers, and industry players. Each chapter explains in detail the important role of nanocellulose, including the advantages and limitations of its specific applications. The book includes commentary from leading industrial and academic experts in the field who present cutting-edge research on advanced materials based on nanocellulose. Improvement features and recommendations are also provided to pave the way to new horizons for nanocellulose, and its applications. Therefore, this book will offer guidance to current, new, and future researchers in nanocellulose to strategize their work to meet the current demands. In terms of commercialization, this book will steer industry players to identify the potential uses of nanocellulose in their products. These same concepts are available elsewhere in the preface. Finally, thoughts on the future directions of nanocellulose-based materials have been included in some chapters.

S.M. Sapuan
M.N.F. Norrrahim
R.A. Ilyas

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12 - Active biocomposite packaging films: Compatibility of carrageenan with cellulose nanofiber from empty fruit bunches

Nurul Aini Mohd Azman

College of Engineering, Universiti Malaysia Pahang, Pekan, Pahang, Malaysia

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Abstract

Biodegradable films are used for protection and to extend the shelf life of food products. A biodegradable film could be defined as a packaging made from biodegradable polymers and food grade additives. Biopolymers such as lipids, proteins, polysaccharides, and mixtures have been investigated to enhance the properties of films as packaging materials. Seaweeds are one of polysaccharides compounds belong to the simplest group of plants, known as algae. Commonly, seaweeds will undergo extraction process to produce refined carrageenan or semirefined carrageenan. Cellulose constitutes the most abundant renewable polymer resource available in nature and has been widely reported as a raw material for biodegradable films due to its renewability, low cost, nontoxicity, biocompatibility, biodegradability, and chemical stability. Plant cellulose can improve the mechanical and barrier properties of seaweed films due to the chemical similarity of seaweed and cellulose, making them highly compatible. Plasticizers are added to provide

the necessary workability to biopolymers. Glycerol is a highly hygroscopic molecule generally incorporated in most hydrocolloid films to allow the modification of the functional properties of films by increasing their flexibility, extensibility, elasticity, and mechanical properties. Incorporation of antioxidants into packaging materials has become popular since oxidation is a major problem affecting food quality. There has been increasing interest in the role of tocopherol (vitamin E) used as a food additive due to its effective inhibition of lipid oxidation in foods. α -tocopherol exhibits excellent antioxidant potency at optimum concentrations and is widely used as an antioxidant added directly to food or in the production of packaging materials.

Keywords

Biodegradable film; Active packaging; Carrageenan; Plastic; α -tocopherol

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