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Tropical Natural Fibre Composites

Properties, Manufacture and Applications

 Springer

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Preface

In tropical regions, natural fibres are found in abundance and many of these fibres are suitable to be used as fibres in composites. The work on natural fibre composites had been carried for many centuries. Ford had used biopolymer from soya and filled with some natural fibres in their experimental cars in the 1950s. Nowadays, the research and development of natural fibre composites have been intensified and many industries have reaped the benefits from their development. As far as the use of fibres is concerned, fibres such as kenaf, oil palm, jute, henequen, sisal, hemp, banana stem, abaca, pineapple leaf, flax and bagasse are suitable candidates, but in this book only fibres that found in abundance in tropical regions are reported. Natural fibres have many advantages that made them suitable to be used as reinforcement or filler in some polymer matrices such as low cost, renewable, abundance, posing no environmental hazard, ease of handling, acceptable specific strength and stiffness properties and aesthetically pleasing. Many research works in the past have been carried out on the characterisation and determination of important properties of natural fibres and their composites. To some extent, natural fibre composites have been used in many products and components such as furniture, automotive components, building and construction industries, appliances and marine industry. However, its use is only limited to mainly non and semi-structural components. The call for green materials has generated interests to use natural fibres with bio-based polymers and fully biodegradable materials can be developed. Attempts are made to produce natural fibre composites with the matrices made from commercially available biopolymers or bio-polymers developed in house. This book is concerned with tropical natural fibres and their composites with polymer materials. However, it focuses on tropical natural fibres and their composites as books on natural fibre composites are now growing in number. It concentrates mainly on selected tropical natural fibres namely kenaf, oil palm, pineapple leaf, sugar palm, banana stem, sugarcane and coconut fibres. In addition, this book presents some new aspects related to natural fibre composites such as design, materials selection and manufacturing process.

This book comprises seven chapters. Chapter 1 provides general information about composite materials. Important aspects of tropical natural fibres are

presented in Chap. 2, which include advantages and disadvantages of natural fibres, description of seven selected tropical natural fibres, and typical applications of tropical natural fibres. The drive for 'green' materials has triggered the need for inclusion of a chapter titled biopolymers. Biopolymers can be used as matrices for natural fibres along with synthetic polymers. In Chap. 4, mechanical properties, which include tensile, flexural and impact properties of natural fibre composites are presented. New topic on the design of tropical natural fibre composite products is given in Chap. 5. Possible manufacturing techniques for natural fibre composites are included in Chap. 6. Finally, a brief chapter on selected products developed from tropical natural fibre composites can be found in Chap. 7.

I am indebted to various organisations and individuals who have made writing of this book possible. The permission and financial allowance given by my employer Universiti Putra Malaysia are highly appreciated that enabled me to carry out this task during my sabbatical leave from October 2013 to June 2014. I am indebted to the cooperation of Dr. Nukman Yusuff of Universiti Malaya who provided facility during my sabbatical leave. I would like to thank my family member; my wife Ms. Nadiah Zainal Abidan, and my daughter Qurratu Aini who have endured the pains and difficulties in the course of preparation of this book. I wish to thank my research assistant, Mr. Wan Mohamad Haniffah Wan Hussin for his assistance.

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