HANDBOOK OF THERMOSET-BASED BIOCOMPOSITES

POLYESTER-BASED BIOCOMPOSITES

Edited by
Senthilkumar Krishnasamy
Chandrasekar Muthukumar
Senthil Muthu Kumar Thiagamani
and Suchart Siengchin

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Polyester-Based Biocomposites

Polyester-Based Biocomposites highlights the performance of polyester-based biocomposites reinforced with various natural fibers extracted from leaf, stem, fruit bunch, grass and wood material. It also addresses the characteristics of polyester-based biocomposites reinforced with rice husk fillers and various nanoparticles.

This book explores the widespread applications of fiber-reinforced polymer composites in the aerospace sector, automotive parts, construction and building materials, sports equipment and household appliances. Investigating the advantages of natural fibers, such as superior damping characteristics, low density, biodegradability, abundant availability at low cost and non-abrasive to tooling, this book discusses what makes them a cost-effective alternative reinforcement material for composites in certain applications.

This book serves as a useful reference for researchers, graduate students and engineers in the field of polymer composites.

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Dedication

Dedicated to my family members

S. Krishnasamy

K. Malliga

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Preface

Fiber-reinforced polymer composites with thermoset matrices such as epoxy, polyester, vinyl ester and bismaleimide resins have been used in widespread applications in the aerospace sector, automotive parts, construction and building materials, sports equipment and household appliances. Natural fiber-based polyester composites have inferior thermal, physico-chemical and mechanical properties over the conventional synthetic fiber-reinforced polyester composites and is considered a potential substitute in applications requiring moderate strength and stiffness. Natural fibers have advantages such as superior damping characteristics, low density, biodegradability, abundant availability at low cost and non-abrasive to tooling, which makes them a cost-effective alternative reinforcement material for composites in certain applications.

This book highlights the performance of polyester-based biocomposites reinforced with various natural fibers and is organized in the following ways: Chapters 1–8 focus on the characterization of polyester-based biocomposites reinforced with natural fibers extracted from leaf, stem, fruit bunch, grass and wood material. Chapters 9–12 address the characteristics of polyester-based biocomposites reinforced with rice husk fillers, various nanoparticles and two or more natural fibers, respectively. Chapters 13–16 highlight the suitability of the polyester-based biocomposites in various applications.

Each chapter of this book has been written by experts with publications. It is our pleasure to have worked with authors who are established researchers in the field of biocomposites and we express our gratitude to the publisher and their staff members associated with this book support. The content in this book could be of help to undergraduate and postgraduate students, research scholars, academic researchers, professionals and scientists looking for fundamental knowledge on the characterization of polyester-based biocomposites, latest research trends and the suitability of such composites in various applications.

Editors

Dr. Senthilkumar Krishnasamy is an Associate Professor at the PSG Institute of Technology and Applied Research, Tamil Nadu, India. He graduated with a Bachelor's in Mechanical Engineering from Anna University, Chennai, India, in 2005. He then chose to continue his Master's in CAD/CAM from Anna University, Tirunelveli, India, in 2009. He obtained his PhD from the Department of Mechanical Engineering, Kalasalingam University in 2016. He then worked in the Department of Mechanical Engineering, Kalasalingam Academy of Research and Education (KARE), India, from 2010 (January) to 2018 (October). He completed his post-doctoral fellowship at Universiti Putra Malaysia, Serdang, Selangor, Malaysia, and KMUTNB under the research topics of "Experimental investigations on mechanical, morphological, thermal and structural properties of kenaf fibre/mat epoxy composites" and "Sisal composites and fabrication of eco-friendly hybrid green composites on tribological properties in a medium-scale application," respectively. His area of research interests includes the modification and treatment of natural fibers, nanocomposites, 3D printing and hybrid-reinforced polymer composites. He has published research papers in international journals, book chapters, and conferences in the field of natural fiber composites

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Dr. Senthil Muthu Kumar Thiagamani is working as an Associate Professor in the Department of Mechanical Engineering at Kalasalingam Academy of Research and Education (KARE), Tamil Nadu, India. He received his Diploma in Mechanical

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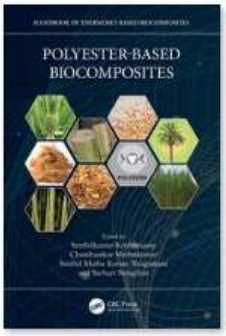

Chapter

Hybrid Polyester and Bio-Polyester Composites

By Siti Noor Hidayah Mustapha, Rohani Mustapha

Book Polyester-Based Biocomposites

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ABSTRACT

This chapter explains the theory and concept of hybrid polyester and bio-polyester composites. The concept, parameters, and performances of multiple continuous and non-continuous systems in polyester composite are well explained in order to improve the properties of current polyester products. Multiple current hybridization approaches are discussed, including the use of multiple synthetic and bio-reinforcing fibers and fillers. In addition, the synthesis of bio-polyester through bacteria fermentation of sugars or lipid and poly(alkylene dicarboxylates) or by partial blending of synthetic polyester with vegetable oil is also discussed, along with its hybridization and applications. The interactions between the continuous and non-continuous, and between all the hybrid entities contained in the composite to allow optimum performance of polyester composite are also highlighted in this chapter. In conclusion, hybridization is the best method that could enhance the properties of polyester and bio-polyester composite to meet the high technology demand in future.