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Advances in Elastomers II

Composites and Nanocomposites

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Preface

This book “Advances in Elastomers-II: Their Composites and Nanocomposites” summarizes many of the recent technical research accomplishments in the area of elastomer-based composites and nanocomposites. As the title indicates, the book emphasizes the various aspects of preparation, structure, processing, morphology, properties, and applications of elastomer-based composites and nanocomposites, in a systematic and comprehensive manner. Recent advances in the development and characterization of multicomponent polymer composites and nanocomposites based on elastomers are discussed in detail. It is important to mention that till date, there are not many books published on the recent advances in the synthesis, morphology, structure, properties, and applications of elastomer-based composites and nanocomposites. The book discussed in various chapters topics such as elastomer macrocomposites, elastomer-based nanocomposites, interphase modification and compatibilization of rubber-based nanocomposites, fully green elastomer nanocomposites, elastomeric micro and nanocomposites for tire applications: past, present, and future elastomer-based bionanocomposites, and physical phenomena related to free volumes in rubbers and blends.

It covers an up-to-date record on the major findings and observations in the field of elastomer-based composites and nanocomposites. The book is intended to serve as a “one stop” reference resource for important research accomplishments in this area. The various chapters in the book have been contributed by prominent researchers from the industry, academia, and government/private research laboratories across the globe. This book will be a valuable reference source for university and college faculties, professionals, post-doctoral research fellows, senior graduate students, polymer technologists, and researchers from R&D laboratories working in the area of elastomer-based composites and nanocomposites.

The first chapter on “Advances in Elastomers-II: Their Composites and Nanocomposites”, gives an overview of the advances in composites and nanocomposites on state-of-art new challenges and opportunities. This chapter is essential for beginners in these fields as it provides a thorough basic understanding of the elastomer-based composites and nanocomposites. The following chapter on “Elastomer Macrocomposites” gives an introduction to elastomer macrocomposites, elastomer-based macrocomposites, recent studies on elastomer-based macrocomposites, different manufacturing methods of elastomer-based macrocomposites,

and characterization methods of elastomer-based macrocomposites. Finally, applications of elastomer macrocomposites are discussed in detail. The third chapter analyzes “Rubber Nanocomposites”; the first part of this chapter gives an introduction and then discusses different types of nanocomposites such as elastomer-based thermoplastic nanocomposites and elastomer-based thermoset nanocomposites.

The fourth chapter, on “Reinforced Elastomers: Interphase Modification and Compatibilization in Rubber-Based Nanocomposites”, is well explained. The chapter opens with a good introduction and later, the authors present several topics such as current trends in interphase modification and compatibilization, development of grafts/block copolymers, and crosslinking. Different compatibilizing agents, surface modifiers, plasticizer properties of interphase modified/compatibilized elastomeric composites, and future prospects are also discussed in detail.

A review of “Fully Green Elastomer Composites” is done in the fifth chapter. The authors deal with the recent development in the area of green elastomers. The chapter comprises an introduction, green elastomers, green elastomeric blends, green elastomer-based composites, processing of green elastomer-based composites and blends, characterization methods, properties and applications, and industrial products based on green elastomers. Finally, the current trends and the path forward is surveyed.

The next chapter is on “Nanocomposites for Tyre Applications”: past, present, and future. The first section contains an introduction on tire manufacture and processing and recent studies of nanocomposites in the tire industry. The last section of this chapter discusses the different techniques used in the tire industry. The following chapter on “Elastomer-Based Bio-Nanocomposites” focuses on different studies on elastomer-based bionanocomposites. This chapter details various topics such as recent studies on cellulose, starch, and chitin/chitosan-based elastomers nanocomposites. Finally, the biomedical application of elastomer-based bionanocomposites is discussed. The chapter on “Bio-Medical Applications of Elastomeric Blends, Composites”, discusses recent developments on elastomeric composite and blends for medical applications and an overview of elastomer-based products for biomedical application. Explanations are given with method and fabrication of elastomeric composite and blends for medical applications. Finally, the current trends and future prospects are discussed. The chapter “Other Applications: Engineering” discusses some of the applications of elastomer composites and nanocomposites, the author-coined title of the chapter, as well as other applications such as Engineering, foot ear, belting, sports, etc. In this chapter an introduction with some theoretical models of elastomeric materials is given. Finally, some industrial applications such as window seal, impact absorbing devices, silent block, hydraulic seals, elastic wheel of railway coach are discussed. The last chapter discusses the “Physical Phenomena Related to Free Volumes in Rubber and Blends”.

Finally, the editors wish to express their sincere gratitude to all the contributors of this book, who provided excellent support for the successful completion of this venture. We are grateful to them for the commitment and sincerity they showed in

contributing to this book. Without their enthusiasm and support the compilation of this book series could not have been possible. We thank all the reviewers who spent valuable time to make critical comments on each chapter. We also thank the publisher Springer for recognizing the demand for such a book, and for realizing the increasing importance of the area of Blends and Interpenetrating Network.

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