Polymer Nanocomposites for Dielectrics

edited by
Wei-Hong Zhong
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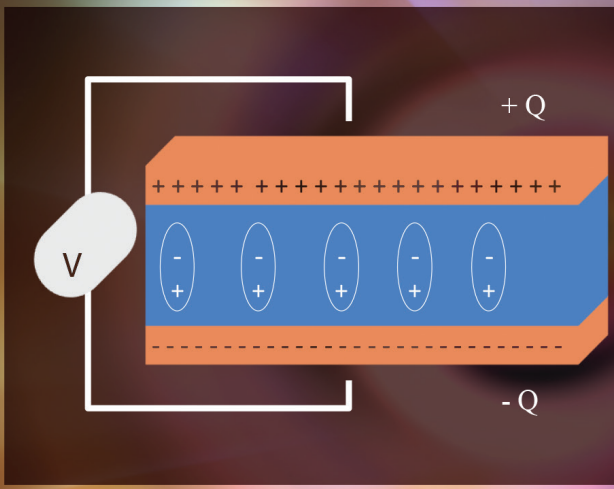

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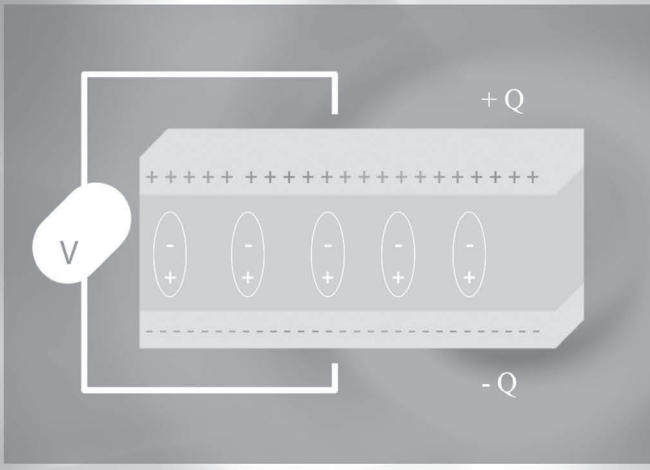

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Preface

Numerous books on polymer nanocomposites are available today to readers having different backgrounds. But what caught our attention was the lack of books that exclusively address the dielectric properties of polymer nanocomposites, in spite of being a highly active research area. Besides playing an essential role in electronics and energy applications, the knowledge of dielectric properties provides an efficient and powerful analytical tool for studying polymer nanocomposites. Therefore, we decided to write this introductory book on dielectric properties of polymer nanocomposites with a special coverage of electrical energy storage. It has been written to provide a useful reference material for scientists, engineers, as well as everyone who needs basic understanding on this topic.

The objective of this book is to address fundamental issues in dielectric polymer nanocomposites, as well as strategies to improve the dielectric performances of polymer nanocomposites. In particular, it focuses mostly on the research published over the past 10 years to provide an up-to-date and relevant knowledge and information. It provides a brief introduction of polymer materials and polymer nanocomposites in Chapter 1, which emphasizes the common issues that are critical to dielectric properties of polymeric materials, including structures and properties of polymer matrix and dispersion of nanomaterials and interfaces. Chapter 2 introduces basic theories and models frequently used in theoretical analysis of dielectric properties of polymer nanocomposites. The application of these theories and models on various representative dielectric polymer nanocomposite systems is discussed in detail along with a summary of their limitations in Chapters 3–8. Chapters 3 and 4 focus on two major types of nanomaterials, perovskite ceramic nanomaterials and carbon nanomaterials in dielectric polymer nanocomposites, while Chapters 5 and 6 discuss fluoropolymers and their copolymers in dielectric polymer nanocomposites. As you may notice, we do not intend to cover all dielectric polymer nanocomposites in this book, instead, only some representative dielectric polymer nanocomposites are discussed, which will

help the readers gain basic understanding of the roles of polymer matrixes, dispersion issues, and interfaces in dielectric polymer nanocomposites. Chapter 7 extends to contemporary interests in bio-based polymer nanocomposites for dielectric applications, containing either bio-based polymer materials or bio-based nanomaterials, or both, while Chapter 8 introduces a more complex nanocomposite structure: hybrid polymer nanocomposites, which suggest an alternate route to desirable dielectric properties in polymer nanocomposites.

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