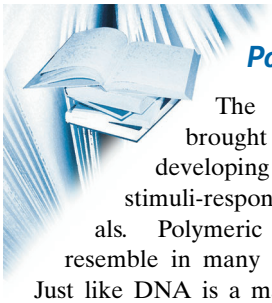

Self-Healing Polymers

The recent decade has brought a number of rapidly developing topics in the area of stimuli-responsive polymeric materials. Polymeric materials themselves resemble in many ways biological systems. Just like DNA is a macromolecule capable of unique biological processes responsible for reproductive functions, there are many processes in Nature that inspired scientists. Among many complex and fascinating biological events, the rapid growth of stimuli-responsive polymers and their resemblance to biological systems has been directed toward strategies for assembling macromolecules to achieve self-healing properties. Although several reviews on this topic have recently appeared, rapid and continuous growth of this field deserves a book with comprehensive and balanced coverage.

The book entitled *Self-Healing Polymers* edited by Wolfgang H. Binder represents a collection of independently crafted chapters, each including useful references in this emerging field. Although the book is well-organized and addresses recent advances in the field, unavoidable repetitions of introductory parts of several chapters make this monograph interesting to read by offering different prospective from individual contributing authors. Of course, unavoidable stylistic differences between chapters are apparent, but each chapter provides slightly different twist and valuable experimental details with many references. The book will serve the broad spectrum of audiences and consists of four logically assembled parts: "Design of Self-Healing Materials" (I), "Polymer Dynamics" (II), "Supramolecular Systems" (III), and "Analysis and Friction Detection of Self-Healing Polymers" (IV).

Within Part I, the first chapter effectively articulates an overview of the field, discussing chemical and physical aspects of self-healing. Focusing on science and engineering of the self-healing phenomena, this chapter actually explains specific concepts from which the reader can learn quite a bit. Nevertheless, omitting magnetically induced polymer network repairs disturbs its completeness. Chapter 2 offers an interesting Nature inspiration to self-healing by focusing on plants self-healing processes and cross-fertilizing these concepts with materials in industrial settings. Modeling of self-healing is highly complicated and has been brought to life in Chapter 3 by examining how structural rearrangements resulting from the breaking and reforming bonds in nanogels contribute to mechanical properties. These studies very nicely walk us though the design process and highlight dynamics of the events as a function of time.

Part II begins with the an academic refresher of the well-known polymer chain dynamics and thermodynamics of gelation which are outlined in Chapters 4 and 5, serving as a prelude to potential future theoretical studies. As a follow-up and complementing previous sections, Chapters 6–8 focus on thermal, light-induced, and mechanochemically induced self-healing. The next couple of chapters offer an overview with several useful examples how to prepare catalyzed systems containing nanocapsules. It is worth noting that materials will not repair by themselves unless their intrinsic (not extrinsic) properties are altered, a component that could be better articulated by the authors.

Part III of the book offers an overview of self-healing that utilizes recent advances in supramolecular chemistry. Three chapters describe the role of H-bonding, metal-complex formation, and self-healing ionomers in polymer systems that typically are low glass transition temperature gels which effectively outline a spectrum of applications.

The last part of the book (Part IV) is dedicated to the analysis of self-healing processes using macroscopic, microscopic, and nanoscopic approaches along with a couple application-oriented topics. The authors correctly point out the fact that self-healing, being relatively new, requires revisiting and re-evaluation of many existing analytical approaches. However, one might have wished to include a growing field of powerful chemical imaging techniques that have been utilized in numerous self-healing studies.

The last chapters are more or less are repetitions of the same topics, and are covered in more than one chapter. The book could be significantly improved if the same concepts were not repeated in subsequent chapters; for example, over a decade old encapsulation concept was presented multiple times in chapters 1, 8, 9, 15, 16, and 17. Regrettably, as much as the idea can be appealing, its practicality might be limited.

The field of self-healing materials in general, and polymers in particular, is continually evolving and the next decade will bring even more exciting discoveries. This monograph should bring a motivating prospective for future as well as for current researchers to take into account the multi-level complexity of self-healing. I strongly recommend this monograph as it certainly covers recent advances and concepts in one volume.

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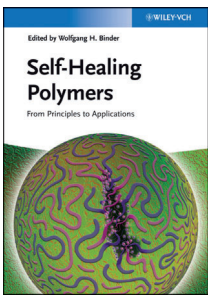

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