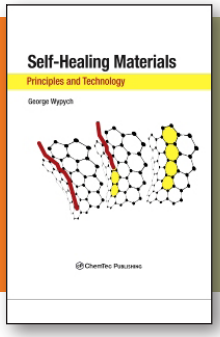
three-dimensional transition-metal oxides, including titanium, vanadium, chromium, manganese, iron, cobalt, nickel, and copper glasses. Rare-earth oxide glasses are described in chapter 3, including praseodymium, neodymium, samarium, and europium containing ones, among others. Chapter 4 describes functional glass-ceramics and their synthesis, processing, and applications. Examples are given for optical, electric, battery, glazes, and ultralow expansion applications. Chapter 5 deals with the functionalization of glasses by laser irradiation, including the modification of refractive index, crystallization, and reduction-oxidation. The functionalization of glasses by incorporation of semiconductors is given in chapter 6. Biomedical applications are described in chapter 7, including bioactive glasses and glass-ceramics (e.g., scaffolds, composites, coatings), antibacterial and drug delivery systems, and ionomer cements. Solid-oxide fuel-cell sealants are presented in chapter 8, including the requirements, classifications, and processing. Chapter 9 discusses glasses and glass-ceramics made from solid waste materials and their processing.

The third part of the book covers non-oxide systems. Chapter 10 describes functional chalcogenide glasses and glass-ceramics. Halide glasses and glass-ceramics are discussed in chapter 11. Finally, chapter 12 covers functional bulk metallic glasses.

Each chapter presents an up-to-date list of references, based on the author's knowledge and work experience. Figures and tables are vivid and well designed.

This book is recommended for postgraduate students, researchers, educators, scientists, and professionals of the glass industry. It can be used as a basic reference for the study of functional glass materials because it is richly detailed on the fundamentals, synthesis, properties, and applications of glasses and glass-ceramics.

Reviewer: Adriano Michael Bernardin *is a professor in the Materials Science and Engineering Graduation Program, University of the Extreme South of Santa Catarina, Brazil.*



Self-Healing Materials: Principles and Technology

George Wypych

ChemTec Publishing, 2017
262 pages, $285.00 (e-book $285.00)
ISBN 9781927885239

I confess that I knew almost nothing about the subject when I started to read this book. However, after finishing, I feel quite knowledgeable about this emerging field of self-healing materials, and therefore recommend the book to the nonspecialist with some constraints.

A self-healing material is one that, once damaged, can fix itself without any external control, much like a wound in the body repairs itself automatically. The topic immediately captures one's imagination—would it be possible to have a plastic part of an automobile body snap back into place with no damage after an accident? Or the car body repaint itself by having pockets of paint suspended in the coatings that are released when under the stress of an accident? Not quite yet, but the book showed me that research is well under way in these areas, and in the future, consumers might see plastics, rubbers, and even metals that heal with little human intervention.

The book starts with an overview of biological (wound) healing, and then progresses to the mechanisms and chemical processes for polymeric materials, including autonomic, click chemistry, cross-linking, and hydrogen bonding. Physical processes such as thermal and infrared healing are also covered. Other chapters cover methods to deliver "healants" to defect sites, as well as additives that induce healing. The main focus is on polymeric materials; 30 different polymers are highlighted. There is also a review of non-polymeric materials, such as cement, foam, and electronics. Other chapters cover methods for characterization.

The format is somewhat unique for a review book, as each topic is covered in brief and is followed by a thorough reference list of relevant journal articles. This is a departure from typical review books in which experts go in-depth into each topic.

I would strongly recommend this book to anyone with an interest in this growing field of self-healing materials. The chapters are brief, the references are excellent, though there are no problem sets. I found myself looking up several references that claimed my interest, and I credit the book with giving a clear and thorough overview of the field. Accordingly, readers should not expect details, but rather guidance toward future reading.

Reviewer: Karen Swider Lyons *researches fuel cell and battery materials and their integration into naval systems in Alexandria, Va., USA.*

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