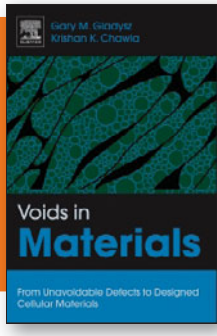

Voids in Materials: From Unavoidable Defects to Designed Cellular Materials
Gary M. Gladysz and Krishan K. Chawla

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The properties of many naturally occurring and manufactured materials are defined by the extent to which they contain voids of various types, shapes, and sizes. The focus of this book is on voids in solid-state materials, including structural materials and biologically inspired hierarchical materials. The target audience is the materials scientist who is a non-expert on porous materials and is interested in an accessible, extended overview of the field.

Unlike many other books on porous materials, which tend to focus on a particular materials class such as polymers where voids play an important role, the authors here introduce and define intentional versus unintentional voids across length scales in multiple classes of materials, including metals, ceramics, polymers, and cellular materials. There is brief discussion of carbon nanotubes, but other nanoporous materials, such as inorganic nanotubes, zeolites, and metal–organic hybrids, are not discussed.

The authors do a good job of highlighting the similarities among voids in these various types of materials and describing the ways in which voids impact their properties. Equations are given throughout, but, as the authors indicate in the preface, the emphasis is on a descriptive rather than a rigorous mathematical presentation. An extensive bibliography is provided so that the interested reader is able to follow up with the source material when greater depth is needed.

The authors next review the methods by which voids are introduced experimentally into materials, fibers, and powders. They further discuss the various ways in which these components can be combined to form composites with a hierarchical porous structure. These materials are distinct from solid-state cellular materials, or foams, which are described in their own chapter. Useful tables are included that list example materials and associated void sizes, along with associated applications and references, which help the reader rapidly navigate the material.

The book closes with a chapter on the applications of materials with voids of different scales and some of the most important methods by which voids are characterized experimentally. Computational materials science is primarily confined to a brief discussion of finite element modeling. This book is recommended to those who desire an accessible, introductory overview to porous materials.

Reviewer: Susan B. Sinnott *of the University of Florida, USA.*

Thermodynamics of Surfaces and Interfaces: Concepts in Inorganic Materials
Gerald H. Meier

Cambridge University Press and the Materials Research Society
251 pages, $120.00
ISBN 9780521879088

In the interest of transparency, MRS is a co-publisher of this publication. However, this review was commissioned by an independent Book Review Board.

This book's author, Gerald H. Meier, is the William Kepler Whiteford Professor of Materials Science at the University of Pittsburgh, where he has taught for over 40 years. The book is touted "as an auxiliary text for students and a self-study guide for industry practitioners and academic researchers." I fall into the latter category; 25 years after taking my last thermodynamics class, I read the book with the goal of brushing up on the fundamentals of surface-related work.

The book is true to its title and covers thermodynamics of materials surfaces with a focus on high-temperature, inorganic materials. Chapter 1 begins with basic bulk thermodynamics (e.g., the handling of multiphase equilibria and the Gibbs phase rule as applied to binary phase diagrams) and then expands to specific cases of surface phenomena. From there, surface quantities are introduced in chapter 2, and the concept of wetting, surfaces of crystalline solids, interphase interfaces, curved surfaces, adsorption, and adhesion are the topics of the following six chapters. Each chapter concludes with a few study questions. While the book preface promises not to have an "overwhelming amount of mathematics," most of the concepts are illustrated mainly with mathematical formulations, followed by simple illustrations.

An advantage of completing a book review is that you are compelled to read the full book. If you buy this book, I encourage you to do the same. Chapter 1 is pretty much all math. However, there may not be a non-mathematical means to explain thermodynamics, and Meier does a good job explaining the basic principles. With the cobwebs around thermodynamics cleared from my head by the end of chapter 1, the book then turned out to be a