With the phenomenal development of electromagnetic wave communication devices and stealth technology, electromagnetic wave absorbing materials have been attracting attention as antielectromagnetic interference slabs, stealth materials, self-concealing technology, and microwave darkrooms. This book starts with the fundamental theory of electromagnetic wave absorption in loss medium space, followed by a discussion of different microwave absorbents, such as manganese dioxide, iron-based composite powder, conductive polyaniline, barium titanate powder, and manganese nitride. Then, structural absorbing materials are explored, including multilayer materials, new discrete absorbers, microwave absorption coatings, cement-based materials, and structural pyramid materials. Many of the graphics demonstrate not only the principles of physics and experimental results but also the methodology of computing.

The book will be useful for graduate students of materials science and engineering, physics, chemistry, and electrical and electronic engineering; researchers in the fields of electromagnetic functional materials and nanoscience; and engineers in the fields of electromagnetic compatibility and stealth design.

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Due to their extensive applications in military stealth technology, most of the research on microwave absorbing materials has been kept secret and classified over the years. In the recent past, with increasing requirements for microwave absorbing performances of these materials and their prosperity in civil applications, new kinds of microwave absorbing materials have emerged, and either their absorbing mechanisms or their applications have attracted considerable attention and made pronounced progress.

This book presents a concise scope of modern microwave absorbing materials, also known as electromagnetic absorbing materials, and their absorption characterizations. The objective is to provide a sound understanding of the fundamentals and concepts of microwave absorbing theories, which also form the basis of the principles of microwave absorbing materials and their absorbing mechanisms.

The content in this book is presented in eight chapters. Chapter 1 is devoted to the fundamental aspects of interactions between electromagnetic waves and microwave absorbing materials. On the basis of principle theory, the crucial factors which may influence the absorbing performances of microwave absorbing materials, such as density, particle size, shape, chemical compositions, and stability, are also included. Chapters 2 to 5 discuss traditional microwave absorbing materials based on manganese oxides, iron matrix alloys, conductive polyanilines, and barium titanates. The preparation techniques and their electromagnetic characterizations are also dealt with. Chapters 6 to 8 give a description of hybrid microwave absorbers, cement matrix absorbing materials, and structural pyramidal materials. Chapter 6 also gives an overview of two main absorbers, absorbing coatings and absorbing structures. Several representative absorbing coatings and structures based on epoxide resin, polyurethane (PU) varnish, silicon rubber, and acrylonitrile-butadiene-styrene (ABS) are introduced briefly. Chapter 7 elaborates on the electrical and electromagnetic properties of cement-based
composite materials filled with carbon materials, metal fillers, and porous fillers. On the basis of the microwave absorbing properties of cement composites filled with expanded polystyrene (EPS), the energy conservation law in electromagnetic fields has been proposed. In Chapter 8, we present the design philosophy of the pyramid absorbers widely used in most anechoic chambers. And also, we propose a new kind of resonant absorber based on carbon-coated EPS and discuss its absorbing mechanism in detail.

To give a more intuitive understanding of the materials in each chapter, we give a full list of references related to the main contents in that chapter. The readers can refer to these lists to get more information.

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