CERAMIC MATERIALS – PROGRESS IN MODERN CERAMICS

Edited by Feng Shi

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Ceramic Materials – Progress in Modern Ceramics
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Preface

As we all know, ceramic materials are inorganic, non-metallic, solid, and inert materials. Things are made from them by the action of heat and subsequent cooling, which may be crystalline or partly crystalline. The definition of ceramic is often restricted to inorganic crystalline materials, as opposed to the noncrystalline glasses, which involve several steps of the ceramic process, and their mechanical properties behave similarly to ceramic materials.

The history of ceramics is as old as civilization, and our use of ceramics is a measure of the technological progress of a civilization. Ceramics have important effects on human history and human civilization. Earlier transitional ceramics, several thousand years ago, were made by clay minerals such as kaolinite. Modern ceramics are classified as advanced and fine ceramics. Both include three distinct material categories: oxides such as alumina and zirconia, nonoxides such as carbide, boride, nitride, and silicide, as well as composite materials such as particulate reinforced and fiber reinforced combinations of oxides and nonoxides. These advanced ceramics, made by modern chemical compounds, can be used in the fields of mechanics, metallurgy, chemistry, medicine, optical, thermal, magnetic, electrical and electronics industries, because of the suitable chemical and physical properties. In particular, photoelectron and microelectronics devices, which are the basis of the modern information era, are fabricated by diferent kinds of optical and electronic ceramics. In other words, optical and electronic ceramics are the base materials of the modern information era.

Bulk ceramics are made into the desired shape by reaction in situ, or by "forming" powders into the desired shape, and then sintering to form a solid body. However, ceramic thin films can be made by chemical or physical deposition. Grains, secondary phases, grain boundaries, pores, micro-cracks, structural defects, and hardness microindentions consist of the microstructure of the ceramics, which are generally indicated by the fabrication method and process conditions.

To explain more about advanced ceramics, this book (organized by InTech – Open Access Publisher) has been written by different authors, who focus on modern ceramics. A feature of this text is that we keep in mind that many of today's high-tech ceramic materials and processing routes have their origin in the potter's craft, microstructures, and properties. Throughout the text we make connections to these

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related fields. The text covers ceramic materials, from the fundamentals to industrial applications, including a consideration of safety and their impact on the modern technologies, including nano-ceramic, ceramic matrix composites, nanostructured ceramic membranes, porous ceramics, and sintering theory models of modern ceramics.

We thank all the authors and all the editors who contributed greatly to this book, and we hope that readers find it interesting.

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