

Preface

This textbook on creep in ceramics is unique since all other treatments of the subject appear only as a part of the general concept of mechanical properties in materials. A collection of papers on creep in brittle materials was published in 1989, containing a set of papers on MgO and Si_3N_4 ceramics. Also, a chapter dealing with creep can be found in the book published in 2014 by Springer: *Mechanical Properties of Ceramics*, providing a taste of this important subject, both in theory and in regard to its practical technological applications. Creep is an important deformation process in ceramics, as in other materials. Although no theoretical basics have yet been formulated for creep phenomena, leaving those working in the field to rely solely on experimental observations, they should be aware that physical laws govern the complex deformation mechanism in materials exposed to creep conditions.

This textbook has two parts. Part I contains 11 chapters. Chapter 1 introduces the basic concept of creep. Chapter 2 describes the general mechanism of creep. Chapter 3 presents the relation of creep to diffusion. Chapter 4 provides a general consideration of creep in ceramics. Chapter 5 discusses creep in single-crystal ceramics and creep testing methods. Chapter 6 describes creep in nanoceramics, followed by creep rupture in Chap. 7. Superplasticity is considered in Chap. 8. Chapter 9 deals with creep and recovery, while the empirical relations related to creep are discussed in Chap. 10. Part I concludes with Chap. 11 on design for creep resistance.

Part II covers creep deformation in technologically important ceramics. The six ceramics most commonly encountered in various technological applications were selected to represent creep in ceramics. These are three oxide ceramics: Al_2O_3 (alumina) in Chap. 12; MgO (magnesia) in Chap. 13; and ZrO_2 (zirconia) in Chap. 14; followed by two carbides: SiC (silicon carbide) in Chap. 15 and BC (boron carbide) in Chap. 16; and concluding with the important silicon nitride ceramic, Si_3N_4 in Chap. 17.

Practical exercises are not given in this textbook, since each lecturer tends to provide his/her own preferred problems, which the students are expected to solve. The author of this book is also not inclined to republish exercises existing in prior

textbooks. Suffice it to say that those interested in creating and/or solving new problems in the field should be encouraged to do so for everyone's benefit.

My gratitude to all the publishers and authors for their permission to use and reproduce some of their illustrations and microstructures. Thanks to Ethelea Katzenell of Ben Gurion University for improving the English.

Finally, without the tireless devotion, understanding and unlimited patience of my wife Ada, it would be difficult to imagine the completion of this book, despite my decades of teaching the mechanical behaviors of materials. Her helpful attitude was instrumental in inspiring its writing.

Here, it is impossible for me not to mention my gratitude to my grandparents for the education they gave me where I spent my childhood and adolescence; they ascended to Heaven in fire, not unlike Elijah the Prophet, though not having been called by God.

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