PREFACE

Inorganic solid-state chemistry has matured into its own distinct subdiscipline. The reader may wonder why we have decided to add another textbook to the plethora of books already published. Our response is that we see a need for a single-source presentation that recognizes the interdisciplinary nature of the field. Solid-state chemists typically receive a small amount of training in condensed-matter physics, but none in materials science or engineering, and yet all of these traditional fields are inextricable components of inorganic solid-state chemistry.

Materials scientists and engineers have traditionally been primarily concerned with the fabrication and utilization of materials already synthesized by the chemist and identified by the physicist as having the appropriate intrinsic properties for a particular engineering function. Although the demarcation between the three disciplines remains in an academic sense, the separate job distinctions for those working in the field are fading. This is especially obvious in the private sector, where one must ensure that materials used in real commercial devices not only perform their primary function, but also meet a variety of secondary requirements.

Individuals involved with such multidisciplinary projects must be prepared to work independently or to collaborate with other specialists in facing design challenges. In the latter case, communication is enhanced, if each individual is able to speak the "language" of the other. Therefore, in this book we introduce a number of concepts that are not usually covered in standard solid-state chemistry textbooks. When this occurs, we try to follow the introduction of the concept with an appropriate worked example to demonstrate its use. Two areas that have lacked thorough coverage in most solid-state chemistry texts in the past, namely, microstructure and mechanical properties, are treated extensively in this book.

We have kept the mathematics to a minimum—but adequate—level, suitable for a descriptive treatment. Appropriate citations are included for those needing the quantitative details. It is assumed that the reader has sufficient knowledge of calculus and elementary linear algebra, particularly matrix manipulations, and some prior exposure to thermodynamics, quantum theory, and group theory. The book should be satisfactory for senior-level undergraduate or beginning graduate students in chemistry. One will recognize from the Table of Contents that entire textbooks have been devoted to each of the chapters in this book, which indicates the necessary limits on the depth of coverage. Along with their chemistry colleagues, physics and engineering students should also find the book to be informative and useful.

Every attempt has been made to extensively cite all the original and pertinent research in a fashion similar to that found in a review article. Students are encouraged to seek out this work. We have also included biographies of several individuals who have made significant *fundamental* contributions to inorganic materials science in the twentieth century. Limiting these to the small number we have room for was, of course, difficult. The reader should be warned that some topics have been left out. In this book, we only cover nonmolecular inorganic materials. Polymers and other molecular substances are not discussed. Also omitted are coverages of surface science, self-assembly, and composite materials.

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