PREFACE

SECOND EDITION

The textbook represents a first course in electronic materials and devices for undergraduate students. With the additional topics in the text's CD-ROM, it can also be used in a graduate introductory course in electronic materials for electrical engineers and material scientists. The second edition is an updated and revised version of the first edition based on reviewer comments, with new topics such as *conduction in insulators, Hall effect in semiconductor, phonons,* and *thermal properties;* new problems; a number of new worked examples; and a new chapter on the *optical properties of materials.* The second edition is one of the few books on the market that has a broad coverage of electronic materials that today's scientists and engineers need. I believe that the revisions have improved the rigor without sacrificing the original semiquantitative approach that both the students and instructors liked.

ORGANIZATION AND FEATURES

In preparing the text, I tried to keep the general treatment and various proofs at a semiquantitative level without going into detailed physics. Many of the problems have been set to satisfy engineering accreditation requirements. Some chapters in the text have additional topics to allow a more detailed treatment, usually including quantum mechanics or more mathematics. Cross referencing has been avoided as much as possible without causing too much repetition, which allows for various sections to be skipped as desired by the reader.

Some important features are

- The principles are developed with the minimum of mathematics and with the emphasis on physical ideas. Quantum mechanics is part of the course but is presented without its difficult mathematical formalism.
- There are more than 130 worked examples, most of which have a practical significance. Students learn by way of examples, however simple, and to that end nearly 150 problems have been provided.
- Even simple concepts have examples to aid learning.
- Most students would like to have clear diagrams to help them visualize the explanations and understand concepts. The text includes numerous illustrations (over 470) that have been professionally prepared to reflect the concepts and aid the explanations in the text.
- The end-of-chapter questions and problems are graded so that they start with easy concepts and eventually lead to more sophisticated concepts. Difficult problems are identified with an asterisk (*). Many practical applications with diagrams have been included. There is a regularly updated on-line extended *Solutions Manual* for all instructors; simply locate the McGraw-Hill website for this textbook.
- There is a glossary, *Defining Terms,* at the end of each chapter that defines some of the concepts and terms used, not only within the text but also in the problems.
- The end of each chapter includes a section *Additional Topics* to further develop important concepts, to introduce interesting applications,

or to prove a theorem. These topics are intended for the keen student and can be used as part of the text for a two-semester course.

- The text is supported by McGraw-Hill's textbook website that contains resources, such as solved problems, for both students and instructors.

Please feel free to write to me with your comments. Although I may not be able to reply to each individual comment and suggestion, I do read all my e-mail messages and take note of suggestions and comments. If you like the text and would like to see a third edition, which takes time to prepare, please send your comments for revisions and changes to the Electrical Engineering Editor, McGraw-Hill, 1333 Burr Ridge Parkway, Burr Ridge, IL 60521, USA.

CD-ROM ELECTRONIC MATERIALS AND DEVICES: SECOND EDITION

The book has a CD-ROM that contains all the figures as large *color diagrams* in a common portable document format (PDF) that can be printed on nearly any color printer to make overhead projector transparencies and class-ready notes for the students so they won't have to draw the diagrams during the lectures. The diagrams have been also put into *PowerPoint* for directly delivering the lecture material from a computer. In addition, there are numerous *Selected Topics* and *Solved Problems* to extend the present coverage. For example, *Elementary Mechanical Properties* allows instructors to include this topic in their courses. *Semiconductor Fabrication* now appears as a selected topic in the CD. I strongly urge students to print out the CD's *Illustrated Dictionary of Electronic Materials and Devices: Student Edition,* to look up new terms and use the dictionary to refresh various concepts. This is probably the best feature of the CD.

ACKNOWLEDGMENTS

My gratitude goes to my past and present graduate students and postdoctoral research fellows, especially, Randy Thakur (vice president, STEAG, San Jose), Brad Polischuk (Anrad, Montreal), Vish Aiyah (Intel, Folsom), Don Scansen (Semiconductor Insights, Ottawa), Reza Tanha (Texas Instruments, Dallas), Chris Haugen (TRLabs, Edmonton), Zahangir Kabir, George Belev, Bud Fogal, and Daniel De Forrest, who have kept me on my toes and read various sections of this book. A number of reviewers read various portions of the manuscript and provided extensive comments. A number of instructors also wrote to me with various comments. I incorporated the majority of the suggestions, which I believe make this a better book. I'd like to personally thank them all for their invaluable critiques, some of whom include:

Çetin Aktik, University of Sherbrooke, Quebec

Fary Ghassemlooy, Sheffield-Hallam University

Furrukh Khan, Ohio State University

Michael Kozicki, Arizona State University

Hilary Lackritz, Purdue University, Indiana

Aaron Peled, Center for Technological Education, Israel

Charbel Tannous and Jacek Gieraltowski, Brest University, France

Mehmet Günes, Izmir Institute of Technology, Izmir

Linda Vanasupa, California Polytechnic State University

Pierre Pecheur, University of Nancy, France

Mark De Guire, Case Western Reserve University, Ohio

Stacy Gleixner and Emily L. Allen, San Jose State University, California

David Cahill, University of Illinois

Allen Meitzler, University of Michigan, Dearborn

Richard Hornsey, University of Waterloo

John Sanchez, University of Michigan

David Cann, Iowa State University

Karen Kavanagh, Simon Fraser University.

S. O. Kasap
Kasap@Engr.Usask.Ca
http://ElectronicMaterials.Usask.Ca

"The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them."

Sir William Lawrence Bragg

To Güler, my mother; Nicolette, my wife; and Alp, my dad