

ing," and then needs only low-order stationary state perturbation theory for the probe interaction. Topics treated in this way include a theorem for low-frequency lasers and non-resonant scattering, resonant and non-resonant two-photon ionization, angular distribution of electrons from resonant multichannel ionization, electron-atom scattering with a weak resonant laser and with a low-frequency laser, degenerate charge transfer in the field of a laser, and laser-induced reactions accompanying atom-atom scattering.

I was glad to see that some of the calculations begin with qualitative theory, simple estimates of orders of magnitude. These are essential to any efficient calculation, but students often have a hard time making them. I was disappointed in this context that there is no qualitative discussion of some common atomic parameters that play no role in the book, in order to explain why they do not. Among these one might include Doppler width, power-saturation linewidth, hyperfine splitting and Zeeman splitting. All of these are potentially important in the laser-atom interaction.

Other small objections could be raised, and there are the usual lamentably many typographical errors, mis-citations, and oversights in proofreading. In addition, the index is simply awful. However, perfection is a standard too rigorous to be useful. By reasonable standards, Mittleman has done a good job. It is likely that this book will find a large number of satisfied readers.

J. H. EBERLY
University of Rochester

Materials at Low Temperatures

R. P. Reed, A. F. Clark, eds.

590 pp. American Society for Metals, Metals Park, Ohio, 1983. \$109.00

The design engineer working with large cryogenic structures and the experimentalist extracting data from a cryostat containing an all-important sample both require information about materials at low temperature. While such information is available in great profusion from a wide variety of sources, those who need it often have a hard time acquiring it at all or obtaining it conveniently in a useful form. One problem is the dismaying number of journals, handbooks, textbooks and conference proceedings among which the data are distributed; another is the lack of uniformity, both in the methods of presentation and in the systems of units. A third is the reliability of the compiled data: how accurate are they, and—more difficult questions—how can one ascertain that they are accurate?

Materials at Low Temperatures greatly reduces the magnitude of the above problems and is sure to receive an enthusiastic welcome from the international cryogenics community.

Thirteen scientists from the Boulder Laboratories of the National Bureau of Standards wrote the book over a period of several years. The 14 chapter titles illustrate the breadth of its coverage: elastic properties; specific heat; thermal expansion; thermal conductivity and thermal diffusivity; electrical properties; magnetic properties; mechanical properties; fracture mechanics; Martensitic phase transformations; compatibility of materials with cryogenics; structural alloys; composites; superconductors; temperature, strain, and magnetic field measurements. The book does not include data for temperatures below 1 K—a region of specialized interest that several recent books and journal articles have covered well.

The authors present a wealth of scientific information in each chapter in such a way that the reader never need feel submerged in an endless array of numbers and units; in other words, this volume is in no sense just a technical handbook. On the contrary, the authors have incorporated a generous amount of tutorial materials. In qualitative discussions they illuminate the sometimes strange behavior of materials at low temperatures; they assess various measurement techniques; and they appraise the role each property plays in determining significant material characteristics or in predicting behavior patterns in the absence of complete data. From chapter to chapter, they maintain stylistic unity above the norm for multi-author volumes. Does the credit go to the editors, whips in hand, or is it just the soothing ambience of the Colorado Rockies?

Because primary data sources are so important in such a book, I should note that the references (listed alphabetically by author and with titles) appear to be reasonably complete and accurate, with a minimum of duplication among chapters. A number of chapters have separate discussions of data sources or information on data quality.

The sixteen-page index rates about an 8 in usefulness on a scale of 1 to 10. The figures and tables are quite readable; the overall appearance of the two-column format is generally pleasing, consistent with a decision to produce a good-looking, albeit expensive volume, worthy of what once was one of the largest materials-research groups in the world devoted to low-temperature research. While I do wish there had been a chapter covering in detail such useful helpmates as adhesives, insulators, varnishes, greases and seals, I still fully agree with the book jacket that *Materials at Low Temperatures* is high-

ly educational and extraordinarily useful.

LAWRENCE G. RUBIN
Francis Bitter National Magnet Laboratory
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