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Handbook of Optical Constants of Solids

Edited by

EDWARD D. PALIK

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Naval Research Laboratory
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Before using the tables and figures of the critiques in Part II of this handbook, the reader should refer to the editor's introduction to these materials (Chapter 1, pp. 6 – 7).

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Preface

Those of us who do optical experiments have on many occasions needed the optical constants of a specific solid in a specific wavelength region. These numbers are often not readily available, and this situation requires a search in AIP, OSA, and CRC handbooks, as well as in reports never published in archival journals, or a visit to the library to sift through computer printouts of papers selected by key words. Then, once the papers are found, the spectral range presented is often narrow (not the one in which we are interested). I know of only two materials, namely, Si and NaCl, that have been treated in great detail (by H. H. Li), and these have served as models for the present work to some extent.

This handbook was roughed out by an *ad hoc* committee during the May 1980 meeting on the basic optical properties of materials at the National Bureau of Standards. Several colleagues, some of whom later became contributors to this volume, made up the committee, including David W. Lynch, H. E. Bennett, Roy F. Potter, M. Hass, and W. R. Hunter, as well as E. V. Cohen of Academic Press. The intent was to present as many materials as feasible over the widest possible spectral range with some discrimination, so that only a single set of numbers would be presented. Also, brief mention was to be made of the experimental technique, sample characterization, and accuracy and precision of the data (if available).

As completed, this handbook enlists the aid of 11 chapter contributors who summarize methods for the determination of the index of refraction n and the extinction coefficient k in various spectral regions (Chapters 1–9) and the absorption mechanisms in solids (Chapters 10 and 11). Significant time was spent on the film-on-a-substrate type of sample, which is so prevalent today in the areas of antireflection and reflection coatings, metals and insulators on semiconductors, multiple semiconductor layers, and deposited and epitaxial films on substrates in general. In addition, 21 contributors have read the published papers on the optical properties of 37 solids of scientific and technological interest and provided critiques. They have extracted from these papers what they feel is the best set of single values of n and k in the spectral range from x rays to millimeter waves and have produced detailed numerical tables and coarse graphs of these data. The original references are also provided should further detail be needed.

These data will be of interest to (1) those optical researchers who spend

their careers working with one material or a class of materials (metals, semiconductors, insulators), (2) those who are interested in optical properties in general, (3) those who are interested in the film on a substrate or multilayer thin films, and (4) those college professors who teach optics. For the teacher, the bird's-eye view of optical properties over the wide spectral range afforded by the graphs and data serves as a good introduction to understanding a wide variety of absorption and dispersion processes and, consequently, optical properties.

As editor, I have had the usual problems of getting results from 27 different scientists in a timely manner. I thank them for their efforts, from which I have learned a lot of optical physics. In addition, I thank Donna D. Strasburg and Dinah W. Smith for their secretarial help.

November 1984 EDWARD D. PALIK

Contents