MAGNETIC SHIELDING

Material For PMT's,
Power Supplies, Transformers,
CRT's, Relays & other components:

- CO-NETIC AA ALLOY — High Permeability .002″ to .100″ thick

  EXCLUSIVE: Perfection Annealed — No further anneal required if severe forming is avoided.

- NETIC S3-6 ALLOY — High Saturation Induction. .004″ to .095″ thick

MAGNETIC SHIELD DIVISION
PERFECTION MICA CO.
740 North Thomas Drive
Bensenville, Ill. 60106, USA
Phone 312 / 766-7800
TWX 910-256-4815

Send for NEW Material, Application and Fabrication Guide MG-5

Circle No. 32 on Reader Service Card

SMALL MONOCHROMATORS

The H-10 and H-20 are our best selling monochromators because they are small, rugged and versatile. They can be used for OEM or for any application requiring high purity monochromatic light in a compact package. Concave holographic gratings permit broad spectral coverage, high aperture and very pure, noise-free spectra in a monochromator that you can hold in your hand.

Circle the reader service number or phone today for complete specifications.

Instruments SA, Inc., J-Y Optical Systems Division, 173 Essex Avenue, Metuchen, N.J. 08840. (201) 494-8660, Telex 844-516. In Europe, Jobin Yvon, Division d'Instruments SA, 16-18 Rue du Canal, 91160 Longjumeau, France, Tel. 909.34.93 Telex JOBYVON 842-692882.

JOBIN YVON **Instruments SA, Inc.**
J-Y Optical Systems Division

Circle No. 51 on Reader Service Card

lack of attention to detail leads to confusing Proust with Prout and produces an "Emil Wigner" for Eugene Wigner.

Burge has enlivened the book considerably by the use of illustrative anecdotes; the one attributed to Denys Wilkinson is a gem.

LAWRENCE C. BIEDENHARN
Department of Physics
Duke University
Durham, N.C.

Mössbauer Isomer Shifts

G. K. Shenoy, F. E. Wagner, eds.
956 pp. North-Holland, New York, 1978.
$107.50

The isomer shift in Mössbauer spectroscopy refers to changes in the resonance energy resulting from electric-monopole hyperfine interaction between the finite nuclear-charge distribution and the electron density at the nucleus. For a typical source-absorber experiment, the shifts depend on two factors: the difference in mean radii for the resonant nuclear levels and the difference in electron densities at source and absorber nuclei. Thus, any treatment of isomer shifts implicitly involves nuclear-structure considerations together with determinations of electron-charge distributions in condensed matter. For a given Mössbauer isotope, the nuclear factor is essentially constant and a determination of this quantity (by calculation or electron-density calibration) allows observed isomer shifts to be interpreted, in principle, as relative electron densities at source and absorber. The isomer or chemical shift was first reported in 1960 by O. C. Kistner and A. W. Sunyar for the case of an α-Fe_2O_3 absorber and source of Co^{57} in stainless steel. This important feature of Mössbauer spectroscopy has motivated a significant amount of research during the ensuing years, and this work is authoritatively surveyed in the present volume.

The amount of study devoted to Mössbauer isomer-shift determination is reflected in part by the size and composition of the present volume: 956 pages, with 21 chapters or subchapters, and six appendices. The large size also reflects the fact that the determination of electron charge-density is a complicated business, particularly when the observed shifts arise from small changes ($\lesssim 10^{-3}$) in the total electron density at the nucleus. Each isotope (significant data for more than 25 isotopes are available) and materials class can represent special cases. Despite this complexity, the authors and editors have produced a useful, indeed definitive, treatment of the field. The graduate- and research-level text edited by Gopal K. Shenoy and F. E. Wagner has achieved its stated goal of providing a standard reference work on Mössbauer isomer shifts.

Part of the value of the book lies in the chapters or appendices that complement central articles (discussed below). For example, the book includes an excellent chapter on nuclear structure as it relates to Mössbauer isomer shifts. In addition, there are chapters dealing with conversion-electron spectroscopy, optical isotope shifts and muonic atoms—techniques that can also provide information about charge-density distributions in condensed media. Pressure effects, isomer-shift changes at phase transitions, and matrix-isolation studies are treated in individual chapters. Motivation for studying matrix-isolated species lies in the unfulfilled quest for a resonant species in a rigorously defined electronic state. The appendices provide useful compilations of Mössbauer nuclide properties, common and reference isomer shifts, tabulated factors relating to isomer-shift analyses and even a table of source-preparation reactions. The volume is durably bound, as it should be at the price.

Because of the numerous chapters, it is not possible to describe their contents in detail. It is useful, however, to give some feeling for the organization and utility of the text. From the outset, it should be noted that the emphasis is upon physical principles and concepts underlying the isomer-shift variations. A large amount of tabular isomer-shift data is naturally available in the text, but it is not a catalog of such information; this applies particularly to the popular Fe^{57} isotope, which is treated in a chapter that reflects the uniformly high quality of authorship in the volume.

The text begins with a useful introductory chapter followed by others dealing with the theory of isomer shifts, their experimental determination and a very complete chapter detailing current methods of computing electron densities in free atoms and in condensed phases. These chapters may be read with profit by graduate students or others interested in hyperfine interactions in the context of Mössbauer spectroscopy. They also provide background and common formulas that are briefly referred to in later chapters; the latter are otherwise self-contained. The authors are recognized, active scientists, and most are condensed-matter physicists who write from this viewpoint. There is an excellent balance in the materials coverage between metals and alloys, and ionic or covalent compounds. The overall treatment is comprehensive in that all available information for all studied isotopes has been surveyed by the various authors.

The price of the volume is sufficiently high that an individual will weigh its long-term use carefully before making the expenditure. The book, however, certainly belongs in condensed-matter libraries as a reference.

In conclusion, we comment briefly on the state of the art in isomer-shift measurements as projected by this volume. The overall picture is of interest to nonexperts in the field and is addressed but briefly in the introduction and in isolated points in the various chapters. This is probably because of the variety of isotopes and levels of sophistication available for calculating electron densities. Thus, it is not possible to answer the question, "How useful, accurate and accessible is the Mössbauer isomer-shift measurement as a determinant of electron density?" without defining the context of the isotope and the material under study. Qualitatively, it turns out that in the limits of ionic configurations, electronegativity trends, well-defined bonding states and so on, the observed shifts can often be interpreted as loss or gain of valence s electrons or shielding by d or other non-s valence electrons. In this connection, early papers by L. R. Walker, G. K. Wertheim and V. Jaccarine, D. A. Shirley, and others have become classical references with the appearance of this volume. But more recent work has revealed many additional mechanisms, often of similar magnitudes, that must be understood before a complete picture is possible. This is especially true in metals, alloys and covalent materials. So, at this time, it is probably fair to say that routine (even occasional) interpretation of isomer shifts as accurately known electron-density changes at the nucleus remains a goal rather than an achievement. Experiment still outpaces theory, but there is ample evidence in this volume that the gap between accurate computations of electron densities and their experimental determinations is narrowing. In any case, it must be remembered that whatever the material, Mössbauer isomer shifts for a wide variety of elements are uniquely able to reflect both classical chemical-bond trends and more devious trends. This fact will continue to stimulate further calculation and experiment, and such work will owe a debt to the present authors and editors for providing clear guideposts at this time.

H. HOLLIS WICKMAN
Department of Chemistry
Oregon State University
Corvallis

book notes

McGraw-Hill Dictionary of Physics and Mathematics. D. N. Lapedes, ed. 1074 pp. McGraw-Hill, New York, 1978. $22.50

This dictionary defines more than 20 000 terms in physics, mathematics, and related disciplines such as statistics, astronomy, electronics and geophysics. More than 600 halftones and line drawings help to clarify many terms. The

SPECTROSCOPY
SCA

Model 606
$325.00

- Dual Integral, Differential or Window Modes
- A-C or D-C Coupled Input
- Internal/External Baseline Input
- 50 mV to 10 V Dynamic Range

Mech-Tronics
NUCLEAR
430A Kay Ave., Addison, Il. 60101
For more information
WRITE OR CALL COLLECT
(312) 543-9304

Circle No. 33 on Reader Service Card