

## Book Reviews

*Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS2 9JT, England). As far as practicable books will be reviewed in a country different from that of publication.*

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**Positron solid-state physics.** Edited by W. BRANDT and A. DUPASQUIER. Pp. xx+710. Amsterdam: North Holland, 1983. Price Dfl 335.00.

Another book on the fringe of crystallography.

Positrons ('positive electrons'), obtained conveniently from radioisotopes such as  $^{22}\text{Na}$ , can be used as a novel tool for the investigation of matter. Their most characteristic behaviour is the well-known annihilation of matter when  $e^+$  and  $e^-$  meet, producing two oppositely directed  $\gamma$ -ray photons (having energy 0.511 MeV). Despite the ubiquity of ordinary electrons in matter, irradiation of solids with simultaneous observation of the emitted  $\gamma$  photons can give considerable information. Annihilation rates are proportional to electron density; the  $\gamma$ -ray photon energies can be modified by the energy distribution of the electrons in the solid; delay (e.g. of 250 ps) of the annihilation event can occur owing to positron-electron correlations, or to the formation of positronium atoms,  $P_s$ , which survive for about  $\frac{1}{2}$  ns. These, and other effects, are affected by phase changes of the solid (or liquid), by temperature change and, especially, by the presence of defects in the solid, which tend to trap  $P_s$ , for example. Hence the information relating to the solid phase investigated. However, the theory is far from simple.

This substantial volume records the proceedings of the International School of Physics that was held in July 1981, at Lake Como. It is emphatically not a text for students, but is addressed essentially to positron physicists.

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**Advances in X-ray analysis. Vol. 26. Proceedings of the 1982 Denver Conference on the Applications of X-ray analysis, Denver, Colorado, August 1982.** Edited by G. R. HUBBARD, C. S. BARRETT, P. K. PREDECKI and D. E. LEYDEN. Pp. xvii+473. New York: Plenum Press, 1983. Price US \$62.50.

This meeting has focused on recent developments in measurement accuracy of  $2\theta$  and intensity in powder diffraction. The articles in this volume have been collected into eight sections including six invited papers: accuracy in X-ray powder diffraction; search/match procedures, powder diffraction file; quantitative XRD analysis; XRD applications and automation; X-ray stress determination, position-sensitive detectors, fatigue and fracture charac-

terization; new XRF instrumentation and techniques; XRF computer systems and mathematical corrections; XRF general applications.

In the first part of the book the five invited papers of the plenary session give a broad perspective of recent activity throughout the world on uses of more accurate data, on methods to achieve greater accuracy, and on fundamental factors affecting the accuracy; the developments leading to the current levels of accuracy in angle and intensity measurements in X-ray powder diffraction are surveyed and the effect of alignment of the diffractometer on the parameters, such as measured  $2\theta$  and intensity values and the calculated  $d$  values, is also discussed.

The second section describes several computer search/match strategies using a very restricted data base in connection with data processing systems and the optimization procedures in profile fitting. The accuracy of quantitative analysis is of great concern in many laboratories. In the third section, several examples of quantitative evaluation of the results of X-ray diffraction, paying attention to both the effects of preferred orientation and the separation of overlapping peaks, are collected; the limitations in quantitative analysis as well as the techniques being employed to improve the results obtained are mainly described. Several applications to a variety of materials and strategies for phase identification by X-ray diffraction, with sophisticated computer methods, are described in the fourth section.

The fifth section, containing 13 papers, reports the results obtained by the application of X-ray diffraction - new techniques for X-ray stress analysis including the use of position-sensitive counter and X-ray fractography for the analysis of fracture mechanisms.

The detection limits and the reproducibility of X-ray fluorescence analysis (XRF) can be increased by various kinds of background reduction and by optimizing the sample preparations and excitation conditions. The sixth section reports recent applications, such as the capability of continuum synchrotron radiation (SR) as a primary source, the reduction of electronic noise by using a cooled input FET preamplifier, a means of increasing the polarized X-ray intensity and a technique for radioisotope-excited characteristic X-rays for X-ray fluorescence.

In the seventh section, computer systems for X-ray fluorescence (XRF) analysis, including fundamental parameter technique programs in energy-dispersive X-ray fluorescence (EDXRF), are considered in connection with matrix-correction methods. Finally, the last section reports XRF general applications to various materials, such as minerals, human bone *in vivo*, glass, coating metal films and coal, together with several examples of simultaneous analysis by a multichannel X-ray fluorescence spectrometer.

This text is therefore invaluable to researchers engaged in X-ray powder diffraction and X-ray fluorescence studies because it offers a lot of interesting pioneering work so that they can stay current with the field. This book will also be