

one-particle solutions of the Dirac and Klein-Gordon equations has not been reflected in the book; cf., in this regard the aforementioned publications of the Lebedev Institute and the monograph by A. A. Grib, S. G. Mamaev, and V. M. Mostepanenko "Quantum effects in intense external fields" (Atomizdat, M., 1980).

Of great interest are the chapters devoted to the evolution of vacuum in supercritical potentials, to the dynamics of collisions of heavy ions, to polarization of many bodies in intense fields, to bosons, to Yang-Mills fields, to strong fields in the general theory of relativity and other chapters. This rapid enumeration already shows what tremendous material

is encompassed in the book. It should be noted that the list of references exceeds 12 pages. Here there is no possibility to dwell on minor defects of the book [for example, the interpretation of formula (19.32)]. Moreover, many of the defects can turn out to be advantages for a better prepared reader since they stimulate reflection and research. On the whole the book is a fundamental effort which contains many original results of the actively working authors. The presentation, as a rule, is clear and accessible even for students. Much useful material for themselves will also be found by specialists in quantum electrodynamics, nuclear theory and adjacent fields.

Scanning electron microscopy

V. G. Dyukov

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L. Reimer. *Scanning Electron Microscopy: Physics of Image Formation and Microanalysis*. Springer-Verlag, Berlin; Heidelberg; New York; Tokyo, 1985, pp. 457 (Springer Series in Optical Sciences. V. 45).

The book examines the physical bases of the methods of scanning electron microscopy and x-ray microanalysis which refer to electron-probe methods of studying near-surface layers of solids. Its contents are based on the materials of a lecture course given by the author in the university of the city of Münster (FRG), and also encompass the material of the previously published book: L. Reimer and G. Pfefferkorn, *RasterElektronenmikroskopie*, 2. Aufl., Springer-Verlag, Berlin; Heidelberg; New York; Tokyo, 1977.

Being designed as a reference textbook the book under review, in contrast to many monographs on the same subject, is characterized by a clear consistency and conciseness of presentation and also by the emphasis in the text on the theoretical aspects of the problems being discussed.

The brief introduction of Ch. 1 introduces the reader to the principle of operation of a scanning electron microscope (SEM) and the physical effects which determine the regimes of its operation. Ch. 2 contains the basic information on the electron optics of an SEM which forms the probe. It also includes a section which describes the principles of scanning and of blanking the latter.

Chapter 3 examines the basic propositions of the theory of the interaction of accelerated electrons with solids. It deals with a phenomena of elastic and inelastic scattering of electrons and their diffusion. The chapter ends with a section describing the effects of local heating, electrical charge and contamination of objects by the electron probe.

Chapter 4 describes the basic regularities in emission of secondary electrons, including Auger-electrons, and x-rays.

Chapters 5-7 are devoted to the technique of detecting different kinds of secondary radiation, and to a description of the methods of processing video signals, and also to the

special features of forming the contrast of images within the traditional regimes of operation of an SEM. In Ch. 7 in addition to methods of the induced current and microcathodoluminescence a description is given of the special regimes of operation of an SEM (transmission, electron mirror, thermal wave and some others).

Chapter 8 emphasizes methods of analyzing the crystal structure of solids based on the phenomenon of electron channeling, and also of electron and x-ray diffraction.

The concluding Ch. 9 introduces the reader to the fundamentals of qualitative and quantitative x-ray microanalysis of the element composition of solids in massive and thin-film objects.

The book under review is doubtlessly useful for students and graduate students learning about the physical bases of local methods of analysis of surfaces and, naturally, for specialists working in different fields of scanning electron microscopy. It contains an extensive bibliography and has excellent illustrations (247 figures). At the same time one cannot acknowledge it to be useful that the author in following a formal classification has placed a portion of the material referring to x-ray analysis in other sections of the book. Thus, for example, the problems of the technique of recording and spectroscopy of x-ray and optical radiations have turned out to be included in the same single section of Ch. 5, although, in view of their specific properties they have very little in common.

In conclusion it should be added that the material of well-known monographs in this field becomes rapidly obsolete due to its rapid development, and therefore the appearance of the book under review is very timely, and the newest methods of scanning electron microscopy have been included in it.

Translated by G. M. Volkoff