spectroscopy; *Raman studies of surfaces*; *Time dependence of scattering processes*; *Biological applications; CARS and other high-order processes*. The total coverage is comprehensive with contributions from almost every important research worker who is active in these fields. If one wanted to assess the current state of the art this would be a good book to browse through, but should it have been published at all?

All contributions are printed directly from masters provided (in typescript) by the authors. Therefore, something between 10 and 30% of this book is blank paper. The papers are adequate as summaries of conference reports, but so lacking in detail as to be almost worthless for reference purposes. One imagines that all work of substantial value will be published soon elsewhere. This reviewer finds difficulty in envisaging the readership which the publishers presumably hope will recommend purchase of this book.

It would be invidious to single out from the 350 or so articles any particular ones for mention here. After skimming through the book one is left with an overall impression of a field of great vitality covering an incredible diversity of subjects. A technique-orientated subject such as this is truly multi-disciplinary. This is laudable, but one must acknowledge that most scientists today have such specialized interests that much will be incomprehensible to the individual.

P. Gans

School of Chemistry
University of Leeds
Leeds LS2 9JT
England

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Sputtering by particle bombardment. I. Physical sputtering of single element solids. Edited by R. Behrisch. **Topics in Applied Physics. Vol. 47.** Pp. x + 281. Berlin, Heidelberg, New York: Springer, 1981. Price US $46.00, DM 85.00.

The most recent book discussing all the different aspects of ion bombardment of solids was published more than ten years ago. This book and two further volumes, which are in print, are intended to update and summarize the knowledge in the fast-growing field of sputtering phenomena. It will be useful not only for scientists actually involved in this field but also for those using any of the many applications of sputtering, like thin-film deposition, micromachining or sputter etching for depth profiling in combination with a surface analytical technique.

Besides an overview by the editor, the four reviews of this first volume concentrate on the physical principles governing the sputtering process of single-element solids. However, not all aspects are dealt with. Some of them, like energy and angular distributions of sputtered particles will be contained in the following volumes.

Sputtering theory is discussed in two contributions. The first one by P. Sigmund brings an introduction to the theory for amorphous (polycrystalline) materials. Ion penetration and collision cascade theory are summarized and also the limits of the linear cascade theory and spike phenomena are discussed. The second contribution by M. T. Robinson focuses on computer simulation techniques for ion bombardment of single crystalline materials. Channeling of ions and focused collision sequences in low-index crystal directions are discussed.

These two theoretical contributions are supplemented by two chapters on sputtering yield measurements of polycrystalline materials (H. H. Andersen & H. L. Bay) and on single-crystalline targets (H. E. Roosendaal).

The sputtering yield, which is defined as the number of ejected target atoms per impinging particle, is of central importance in sputtering and its applications. Different methods to measure the yield are discussed and an extremely large amount of experimentally determined yield data has been collected from the literature. This chapter alone has over 400 references. These measured sputtering-yield data for over 40 elements are presented graphically as a function of bombarding ion energy for different noble gas ions and compared with calculated values according to the linear cascade theory as discussed in the first contribution. These data and those concerning the dependence of the sputtering coefficient on the angle of ion incidence are most valuable for anybody interested in actual sputtering yield data for a given ion–target combination.

The topic of the last contribution is the variation in the sputtering yield with angle of incidence of the incoming ion beam relative to the crystallographic orientation of a single-crystal target. This is discussed in terms of the channeling model.

G. Betz

Institut für Allgemeine Physik
Technische Universität Wien
Karlsplatz 13
A-1040 *Wien*
Austria

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Photoelastic and electrooptic properties of crystals. By T. S. Narasimhamurty. Pp. xxix + 514. New York: Plenum, 1981. Price US $37.50.

This book starts with a short historical introduction and a reasonably concise review of mathematical tools that will be needed. This is followed by a discussion of symmetry requirements on the photoelastic constants. A section on elasticity including some discussion of experimental methods is then provided. Chapters on measurements of the photoelastic constants and a discussion of classical theories of photoelasticity then conclude this section of the book. The portion dealing with linear and quadratic electrooptic effects occupies the concluding chapter. This, together with a short chapter on piezoelectricity, is about 20% of the book. A bibliography with titles of over 1600 items ranges from Brewster's 1815 paper through 1979. The notation used appears consistent and is summarized in a convenient table. Some descriptions of and references to technical applications appear in various parts of the book. The principal emphasis throughout is on understanding the effects of crystal symmetry and this is, after all, the first thing one must do in studying the effects.

In order to get some idea of the flavor of this book, let us look in more detail at Chapter 3 which is entitled *Pockels'* *phenomenological theory of photoelasticity*. The use of the optical index ellipsoid is mentioned in connection with the introduction of stress–optic and strain–optic tensor components. The relation between these two kinds of coefficients is mentioned and the use of two- and four-suffix notation is discussed. Both sets of coefficients are then tabulated for the 32 point groups plus isotropic solids. The author takes care to indicate which components were incorrect in Pockels's original formulation. The tabulation has the individual components written with numerical subscripts instead of making use of the more usual dot and circle notation. As a result, over five pages are required for the tabulation, and it is not as easy to spot relations between components in a given point group. The bulk of the chapter is then spent in deriving the nonvanishing independent coefficients in the tables by three different methods. Firstly, the effects of different symmetry elements on the components are used; secondly, direct matrix methods are used, and, finally, group theory is used. Since it is necessary to provide some discussion of group theoretical methods this derivation is actually 37 pages or 40% of the chapter. The author works through many examples in considerable detail, writing out what other authors might have left as 'exercises for the student'. This explicit style leads to many equations: In one stretch of less than five pages there are 62 numbered equations.

In the chapter on elasticity some of the above statements also apply. The tabulation of stiffness and compliance tensor components requires more room than it might have and listing each component separately in order to show the relations between two- and four-suffix notations requires two extra tables of doubtful value. Much of this chapter is about experimental methods and seems to this reader to be clear and of the right length.

The discussion of experimental methods of determining photoelastic constants ranges from Pockels's experiments to Brillouin scattering and other ultrasonic methods using laser beams. In the not too distant future, when every experimenter has a tuneable laser, many of the traditional methods will be of historical interest as the author implies.

Since the author's specialty is photoelasticity, one might expect the treatment of this topic to be more extensive and authoritative than the treatment of electrooptics and this is clearly the case. The symmetry restrictions on the third-rank linear electrooptic tensor components are worked out using tensor methods and the relation between primary (constant strain or high frequency) and secondary coefficients is clearly stated. This being the case, it is surprising that the table of representative coefficients comes from a source that does not distinguish primary and secondary effects and ignores the signs of coefficients. It is stated that all measurements in this table were made 'in the visible region, where the dispersion (of the coefficients) is negligible'. This is not true in general since dispersion of the coefficients depends on things such as proximity to the band edge. The table includes values for GaAs, which is opaque in the visible. It is also surprising that the heterodyne measuring method, which yields values for individual coefficients directly and measures the primary effect, was not mentioned, although many of the references cited make use of this technique.

The book provides a thorough, phenomenological treatment of traditional photoelastic properties – traditional because the strain tensor used does not include an antisymmetric or rotational contribution. The examples and derivations used are typically done in great detail.

E. H. TURNER

Bell Laboratories
Holmdel
New Jersey 07733
USA