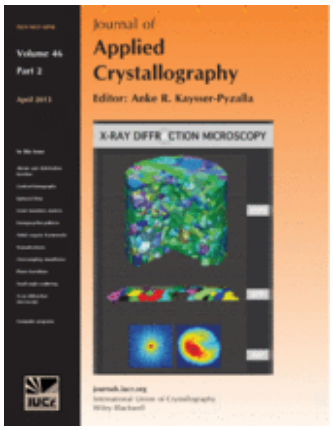

Combined Analysis. By D. Chateigner. Pp. xviii + 497, 188 figures + 46 tables. London, Hoboken: ISTE Ltd, Wiley, 2010.
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This book, written by Daniel Chateigner, a Co-Editor of the *Journal of Applied Crystallography*, aims to introduce a new methodology in the characterization of polyphase and polycrystalline materials using the techniques of polycrystalline diffraction, either by X-rays (including synchrotron) or neutrons (including magnetic scattering, for magnetic quantitative texture analysis).

The book is arranged in ten chapters presented in a pleasant didactic way.

The first chapter, *Some basic notions about powder diffraction,* reminds the reader of the theoretical and practical background of diffraction, including the most advanced techniques of linear and surface detectors for both X-ray and neutron diffraction. **The second chapter**, *Structure refinement by diffraction profile adjustment* (Rietveld method), goes into the details of the application of Rietveld refinement techniques, the dissemination of which the author has contributed to significantly in the world of quantitative texture analysis (QTA) as a standard methodology. **Chapter 3,** *Automatic indexing of powder diagrams*, summarizes the principle and common methods in three compact pages, concluding with useful quality criteria. **Chapter 4,** *Quantitative texture analysis*, represents the core of QTA based on polycrystalline X-ray or neutron diffraction. Concise and vivid descriptions are given of the numerous methods, e.g. Bunge's harmonic method, Matthies's WIMV method, Van Houtte's exponential harmonic method, Schaeben's entropy maximization and many others. Characteristic features and one or two basic equations are offered to illustrate each of them. What is less commonly found in previous QTA books is the list of the most popular texture code packages. The strong points of each package are mentioned, followed by a series of the routines included. Among these packages, *Material Analysis Using Diffraction* (MAUD), to which the author contributed concerning both development and dissemination, has one of the widest applications. This chapter closes with magnetic QTA, largely developed by the author, with the development of a sample holder allowing the measurement of the three-dimensional orientation density function of magnetic moments and polarization under the effect of a magnetic field of medium intensity (0.3 T).
Chapter 5, *Microstructure analysis,* is dedicated to microstructural aspects (isotropic and anisotropic crystal sizes, and microdistortions of powder diffraction profiles).

Chapter 6, *Quantitative phase analysis*, summarizes the use of Rietveld analysis in the framework of the MAUD package (see above, Chapter 4) in five compact pages, concluding with the detection limit for a phase fraction.

Chapter 7, *Residual strain–stress analysis*, deals with both isotropic and anisotropic materials. Great care was taken for the composition of **Chapter 8,** *X-ray reflectivity*; it includes, inter alia, matrix formulation and the Born approximation. This interesting topic has very seldom been covered in the common literature on texture analysis. **Chapter 9**, *Combined structure–texture–microstructure–stress– phase reflectivity analysis*, goes into the detail of the new methodology for combined analysis that is used as the title for the book. This chapter is written as a kind of detective story, in which the reader is held in suspense and looks forward to finding out how the superimposed effects will be de-correlated. For instance, the crystallographic texture/residual stress couple can be separated, since the orientation distribution function f(g) is determined by the intensities of the pole figures Ph(y), whereas the residual stresses can be derived from the mean line positions h. Similar clues are outlined for the texture/structure couple, multiple layers including the substrate, various microstructural states etc. The book closes with

Chapter 10, *Macroscopic anisotropic properties*, which can be taken as a model of clarity on this intricate topic.

Why should this book find its place on the shelves of all laboratories engaged in materials science and all university libraries? When browsing through the book, the reader feels compelled towards full immersion into it, owing to the clarity of presentation of both text and equations and the high quality illustrations and tables. This book is definitely a milestone in fully quantitative combined analysis, following the work by G. Wassermann and J. Grewen, Texturen Metallischer Werkstoffe (Springer Verlag, 1962), based on pole figure analysis – which had a more qualitative turn – and the work by H. J. Bunge, Texture Analysis in Material Science

(Butterworths, 1982), which introduced fully quantitative texture analysis but omitted all the other characteristics except crystallographic orientation.

The scientific level, including the mathematical/physical treatment, is excellent. The author is keen to use convolution formalism, Fourier analysis and tensor calculus, and delivers the subject with such fluidity that even an MSc student could easily follow it. The experienced scientist will, in addition, be sensitive to the elegant treatment of the underlying symmetries, the unification of all anisotropic physical properties within the framework of generalized thermodynamics, and the tensor calculus with full respect for the distinction between covariant and contravariant indices.

The reviewer would like to commend this remarkable book to students, teaching staff and researchers alike, and trusts that they will learn from and enjoy the reading of it as much as he did.

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