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Book Review

STANDARD DISTRIBUTIONS IN TEXTURE ANALYSIS—VOLUME 1: MAPS FOR THE CASE OF CUBIC-ORTHOROMBIC SYMMETRY, by Siegfried Matthies, Galina W. Vinel and Kurt Helming. Akademie-Verlag, Berlin (DDR) 1987.

The authors of this book are first rank experts in the field of mathematical texture analysis. Siegfried Matthies has been one of the very first mathematicians who really understood the problem of "ghost peaks" appearing in crystallite orientation distribution functions (O.D.F.). In the course of this process, he developed a comprehensive theory concerning the problem of pole figure inversion.

Most of this theory can be found in Part I of the present book: "Mathematical and Methodical Fundamentals," 139 pages including many figures, tables and the source codes of several Fortran computer programmes for the calculations of model functions and their "ghosts."

Part II of the work consists of 299 pages of tables and so-called "standard maps." The tables give a.o. items coefficients for the construction of symmetrisized spherical harmonics. The "standard maps" show pole figures, inverse pole figures, "complete" O.D.F. (without ghosts) and "reduced O.D.F." (with ghost maxima) of a certain number of "standard" textures, i.e. Gaussian and Lorentzian distributions of several widths around 8 ideal orientations. Five of these are the main texture components of the rolling textures of f.c.c. metals: $\{011\}\langle 211\rangle$, $\{112\}\langle 111\rangle$, $\{123\}\langle 634\rangle$, $\{011\}\langle 100\rangle$ and $\{001\}\langle 100\rangle$. The three other ideal orientations are frequently observed in the rolling textures of b.c.c. metals: $\{111\}\langle 112\rangle$, $\{112\}\langle 110\rangle$ and $\{001\}\langle 110\rangle$. However no standard maps are given for $\{111\}\langle 110\rangle$, another important texture component of the rolling textures of b.c.c. metals.

Part I: "Mathematical and Methodical Fundamentals" is not a

review on all aspects of O.D.F. analysis but a very interesting, high-level treatise on the *feasibility* of the "central problem" of O.D.F. analysis: pole figure inversion. Many aspects of the problem are discussed, for example the role of crystal symmetry (all crystal classes are treated), the role of sample symmetry, the importance of the "phon" (isotropic part of the O.D.F.), the problem of the "invisible" part of the O.D.F. and its relation to the "odd" coefficients of the series expansion and to the so-called "ghost peaks." An error analysis is presented, and a few procedures for ghost correction such as the zero range method and the WIMV method (in fact a complete pole figure inversion method) are discussed. The last chapters describe the so-called standard functions, i.e. Gaussian or Lorentzian model functions around ideal orientations.

The treatment of these topics is very rigorous and rather abstract, without many examples from metallurgical practice. It is therefore quite demanding on readers, who must have a basic knowledge of crystallography and experience in O.D.F. analysis. Newcomers in the field are strongly advized to read a standard textbook about O.D.F. analysis first, such as "Texture Analysis in Material Science" by Bunge. Regarding this aspect, it is unfortunate that the authors of the present book did not use Bunge's conventions and notations (now widely accepted) for Euler angles, normalization formulas, spherical harmonics etc. The use of these conventions would have made the present work more accessible to non-expert readers.

The "standard maps" in Part II are interesting for those actively involved in O.D.F. analysis of rolling and recrystallization textures of cubic metals (or of other textures of cubic-orthorombic symmetry), but they are not indispensable. To my opinion, a reliable computer code that automatically performs a ghost correction would be a more useful tool, since a (non-automatic) examination of each O.D.F. by means of the standard maps is too time-consuming in practice. Computer codes that perform well in most cases have already been developed in several laboratories; the WIMV-method described in Part I of the present book belongs to this category.

Summarizing, it can be concluded that the present book is very interesting to those who want to gain a full understanding of the

problem of the "ghost peaks" in O.D.F. analysis, and also to those who want to perform O.D.F. analysis on non-cubic materials. The readers should already have experience in the fields of crystallography and O.D.F. analysis.

The presentation of this hard-cover book is very good, with excellent printwork and artwork. The use of the English language is not always elegant.

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