CRYSTAL GROWTH & DESIGN

Book and Media Reviews

pubs.acs.org/crystal

Review of *Basic Concepts of Crystallography. An Outcome from Crystal Symmetry*

Basic Concepts of Crystallography. An Outcome from Crystal Symmetry, by Emil Zolotoyabko, Wiley-VCH: Weinheim, Germany, 2011. 266 pp. US $65. ISBN 978-3-527-33009-6.

Translational symmetry in three-dimensional space is a prerequisite for a solid to be called a crystal. Together with a number of further symmetry elements (inversion center, mirror plane, rotation axes, mirror planes, screw axes, and glide planes), the symmetry elements can be combined into 14 Bravais lattices, 32 point groups (crystal classes), and 230 space groups in real space. Many physical properties of crystals can be understood by introducing the concept of reciprocal space; the determination of the atomic packing in crystals, i.e., the crystal structure, by diffraction methods is perhaps the most prominent example of the application of the language of reciprocal space.

Emil Zolotoyabko's book was originally intended for undergraduate and graduate students specializing in materials science and engineering. It is, however, extremely useful for all who want to get acquainted with crystal symmetry. Therefore, the language of crystallography is taught first: real and reciprocal space, basic calculations, and stereographic projections. Local (point) symmetries follow: the combination of basic symmetry elements to the 32 point groups that are possible in three-dimensional crystallography as well as their importance for the outer form of crystals. The discussion of spatial symmetry starts with Bravais lattices and atomic packing, introduces "new" symmetry elements which are not reflected in the form of a crystal, and combines these with point group symmetries to space groups. A very valuable introduction follows on the graphical and further information that is provided by the International Tables for Crystallography. The last third of the book is devoted to physical properties of crystals that are related to symmetry. Vector and tensor properties such as ferroelectricity, dielectric permittivity, birefringence, piezoelectricity and elastic moduli as well as the propagation of acoustic waves, the reduction of crystal symmetry by external fields and, finally, twinning in crystals are discussed in well-illustrated chapters.

Although, as a solid state chemist, I have taught crystallography directed to structure determination and crystal chemistry, I found this book extremely valuable and will revise and expand some of the chapters for my lectures. As an introduction to the "Basic Concepts of Crystallography" this book is recommended to any student in science and engineering. Studied together with a book on crystal structure determination and systematic crystal chemistry, the book is most valuable for solid state chemists. Other directions in science and engineering need to build on the basic concepts with more specialized books.

Gerd Meyer*

Universität zu Köln, Cologne, Germany

AUTHOR INFORMATION

Corresponding Author

*E-mail: gerd.meyer@uni-koeln.de.

Notes

The authors declare no competing financial interest.

Published: October 11, 2012

dx.doi.org/10.1021/cg301409s | *Cryst. Growth Des.* 2012, 12, 5833−5833