

Electron Crystallography: Electron Microscopy and Electron Diffraction (International Union of Crystallography Texts on Crystallography)

By Xiaodong Zou, Sven Hovmöller, Peter Oleynikov

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Xiaodong Zou, Sven Hovmöller, Peter Oleynikov


In the modern world of ever smaller devices and nanotechnology, electron crystallography emerges as the most important method capable of determining the structure of minute objects down to the size of individual atoms. Crystals of only a few millionths of a millimetre are studied. This is the first textbook explaining how this is done. Great attention is given to symmetry in crystals and how it manifests itself in electron microscopy and electron diffraction, and how this symmetry can be determined and taken advantage of in achieving improved electron microscopy images and solving crystal structures from electron diffraction patterns.

Theory and practice are combined; experimental images, diffraction patterns, formulae and numerical data are discussed in parallel, giving the reader a complete understanding of what goes on inside the "black boxes" of computer programs.

This up-to-date textbook contains the newest techniques in electron crystallography, including detailed descriptions and explanations of the recent remarkable successes in determining the very complex structures of zeolites and intermetallics. The controversial issue of whether there is phase information present in electron microscopy images or not is also resolved once and for all.

The extensive appendices include computer labs which have been used at various courses at Stockholm University and international schools in electron crystallography, with applications to the textbook. Students can download image processing programs and follow these lab instructions to get a hands-on experience of electron crystallography.

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- Rank: #3471967 in eBooks
- Published on: 2011-08-18
- Released on: 2011-08-18
- Format: Kindle eBook

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Editorial Review

Review

'The fields of electron microscopy and electron diffraction have been around for a long time and, until recently, it has proved difficult to use these techniques to determine the structures of crystals in the way that traditional x-ray crystallographers have been doing. However, the new subject of Electron Crystallography has been rapidly developing and this book shows beautifully how modern electron microscopes can now be used to solve crystal structures. The authors have produced a unique and thorough work that will enable students and researchers alike to learn how this is done. Electron Crystallography is the only book that I am aware of that describes modern electron diffraction/microscopy at a genuinely readable level. It should find a place on the shelves of students and researchers alike.' Michael Glazer, Department of Physics, University of Oxford

About the Author

Xiaodong Zou is the chair of Inorganic and Structural Chemistry Unit, Department of Materials and Environmental Chemistry, and director of the Berzelii Centre EXSELENT on Porous Materials, Stockholm University. She is a member of the IUCr Commission on Electron Crystallography (2002-2011) and the Structure Commission of International Zeolite Association (2010-). She received several awards, including the K.H. Kuo Award for Distinguished Scientist (2010) and , Goran Gustafsson Prize in Chemistry (2008) and Tage Erlander Prize (2002), both given by the Royal Swedish Academy of Sciences. Her main research interests include method development for 3D structure determination of nano-sized materials by X-ray diffraction and electron crystallography, especially on zeolites and related porous materials and complex intermetallic compounds, and synthesis and applications of inorganic open-framework materials and metal-organic frameworks.

Sven Hovmoller was visiting scientist in Madrid and Nantes and was Secretary of the IUCr commission on Electron Crystallography 1999-2002. He introduced image processing of EM images by Fourier transform analysis from molecular biology into inorganic chemistry in 1984 and started, together with Xiaodong Zou, the series of annual International schools in Electron Crystallography, in 1994. Hovmoller develops new methods and computer programs for electron crystallography and is also interested in quasicrystals and their approximants and protein structure and its prediction.

Peter Oleynikov has been a researcher at Stockholm University since 2008. He writes programs for computer control of electron microscopes and for analysis of the diffraction data obtain, as well as programs simulating EM images and electron diffraction patterns.

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