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## Book Review

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## Local Structure from Diffraction

Plenum Press New York and London 1998, ISBN 0-306-45827-6, 399 pages  
U.S.Dollars 120.00

*Local Structure from Diffraction* represents the actual volume of the series of books *Fundamental Materials Research (M. F. Thorpe, series ed.)*, related to fundamental problems in materials sciences. There are a plenty of textbooks about analysing the crystal structures and long-range order, mainly based on the analysis of Bragg peak positions and intensities. But the atomic short-range order in materials which is hidden in the diffuse scattering intensity is not treated yet in a compendium. The characterisation of local structures becomes more and more important because many new materials with potential technological applications are quit disordered. Examples are semiconductor alloys, ferroelectric materials, nano- or microporous materials (zeoliths, pyrolitic graphite) or molecular crystals.

The editors tried to complete the gap with a collection of 20 articles from various authors which results from the manuscripts of an international workshop on *Local Structure from Diffraction*, which was held in Michigan, USA in 1997.

It is the nature of a such a collection written by the experts of the field, that it is addressed more to the experienced researcher than for the student. But for newcomers with fundamental knowledge in structural crystallography it offers an easy start into the subject. This is very well demonstrated with the first contribution "*Pair density function (PDF) analysis applied to crystalline materials*" by T. Egami where one of the fundamental concepts originally developed for liquids and amorphous materials is translated for the use for partially disordered solid systems. The basics are given as well as some applications for ferro/-piezoelectric oxide systems, high temperature superconductors or organic MX chain compounds. A look into the reference list of this article as well as in the following ones shows, that the authors not only focussed on the present state of the art (up to 1997) but also take reference to the basic concepts beginning in the sixties.

Without going now into the details, the mean part of the papers deals with the diffuse X-ray and neutron scattering, the modelling by Monte Carlo and reverse Monte Carlo methods respectively and advances in the PDF-theory. A very promising refinement of the PDF is given by S.J.L. Billinge "*Real-space Rietveld: Full profile structural refinement of the atomic pair distribution function*". This approach shows some analogies to the Rietveld refinement of powder diffraction data but the atomic PDF becomes now a fitting function in the real-space which yields the local short range order and not the average crystal structure like from a conventional Rietveld analysis in the reciprocal-space.

The materials discussed are oxides, disordered silica phases, ternary semiconductors, superconductors and metallic alloys, as well as polymers and proteins.

Although the emphasis of the series is on basic science rather than on application, a lot of practical examples for local structures in different materials as well as for the instrumentation are given. Some examples are "*The recording and interpretation of diffuse X-ray scattering*" by T. R. Welberry, "*Neutron scattering and Monte Carlo studies of disorder in oxides and hydrides*" by W. Schweika and M. Pionke or "*Studies of local structure in Polymers using X-ray scattering*" by M. J. Winokur.

Completed by a short index and the addresses of the participants of the workshop the proceedings allow the reader to find any subject of interest either in the book itself or by contacting the authors directly via internet.

Therefore the present collection of highlights gives good and detailed insights into the actual problems of disordered and local structures, but the comprehensive work about the characterisation of short range orders in solids is still missing and may be written by one of the authors !

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