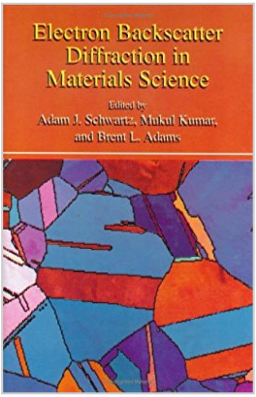

Electron Backscatter Diffraction in Materials Science

From Springer

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Crystallographic texture or preferred orientation has long been known to strongly influence material properties. Historically, the means of obtaining such texture data has been though the use of x-ray or neutron diffraction for bulk texture measurements, or transmission electron microscopy (TEM) or electron channeling for local crystallographic information. In recent years, we have seen the emergence of a new characterization technique for probing the microtexture of materials. This advance has come about primarily through the automated indexing of electron backscatter diffraction (EBSD) patterns. The first commercially available system was introduced in 1994, and since then the growth of sales worldwide has been dramatic. This has accompanied widening applicability in materials science problems such as microtexture, phase identification, grain boundary character distribution, deformation microstructures, etc. and is evidence that this technique can, in some cases, replace more time-consuming TEM or X-ray diffraction investigations. The purpose of this book is to provide the fundamental basis for EBSD. The formation and interpretation of EBSD patterns and the gnomonic projection are described as the framework for materials characterization using EBSD. Traditional representation of texture in orientation space is discussed in terms of stereographic projections, pole figures, inverse pole figures, and orientation distribution functions before introducing the Rodrigues-Frank representation of crystallographic texture. The fundamentals of automated EBSD and the accuracy of EBSD measurements are then discussed. Current hardware and software as well as future prospects for analyzing EBSD data sets are reviewed. A brief mention of the criterion required for the purchase of an EBSD system is included as an aid to this relatively new area of materials characterization. The section concludes with chapters from three manufacturers of EBSD equipment that highlight recent advances in capabilities. The book concludes with a review of recent applications of the technique to solve difficult problems in materials science as well as demonstrates the usefulness of coupling EBSD with other approaches such as numerical analysis, plasticity modeling, and TEM. Attention is paid to the measurement and mapping of strain using EBSD as well as the characterization of deformed microstructures, continuous recrystallization, analysis of facets, ceramics, and superconducting materials.

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Electron Backscatter Diffraction in Materials Science From Springer Bibliography

- Sales Rank: #5383136 in Books
- Published on: 2000-09-30
- Original language: English
- Number of items: 1
- Dimensions: 10.00" h x .81" w x 7.01" l, 1.80 pounds
- Binding: Hardcover
- 350 pages

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