Texture of Crystalline Solids
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BOOK REVIEW

CERAMIC MAGNETS (Keramische Magnete), by G. Heimke

Applied Mineralogy, Vol. 10, edited by V. D. Frechette (Alfred, N.Y., U.S.A.), H. Kirsch (Essen, FRG), L. B. Sand (Worcester, Mass., U.S.A.) and F. Trojer (Leoben, Austria)

Springer-Verlag, Vienna, New York, 1976, 149 pages, 89 figures, ISBN 3-211-81389-6, DM 69 (in German)

The book is intended as a brief introduction for the practical engineer starting work in the production of ceramic magnets. Its main intention is to bridge the gap between the divergent topics of magnetophysics, mineralogy, material science, and technology which are the fundamentals for the understanding of ceramic magnets and which are usually not familiar equally well to the beginner.

Hence, in the first chapter an introduction to magnetism is given. The quantities of the magnetic field are being defined, the fundamentals and general properties of magnetic materials are discussed. The magnetization processes and their dependence on structural properties of the material are summarized especially with respect to permanent magnets. The magnetic circuit and its optimization is treated as well as power losses occurring in alternating-current applications of magnetic materials.

A second chapter is devoted to the measurement of magnetic properties especially with respect to production control.

In a third chapter the structural properties of the main ceramic permanent magnet materials, Ba-, Sr-, and Pb-ferrite are discussed starting with the crystallographic data, the single crystal magnetic properties and the structures and textures of polycrystalline materials.

The crystallographic anisotropy of the magnetic properties as well as the shape anisotropy of the crystallites contribute to the macroscopic anisotropy of the polycrystalline product. They are closely related to the texture (orientation distribution) and grain structure (shape distribution) of the polycrystalline material. Orientation and shape distribution are strongly controlled by the individual production steps thus leading to macroscopically isotropic or anisotropic qualities which are both being used.

Nevertheless as to the referees feeling the phenomenon of preferred crystal orientation has not yet been studied and applied to the production of anisotropic magnets to its full potentialities thus asking for further investigations and developments in this direction.

In Chapter 4 the technological production steps and their influences on the properties of the final product are being discussed. These enclose the raw materials, the grinding, mixing, pressing, sintering, calcinating, the magnetic field treatment, and finishing.

In a final fifth chapter some typical applications of ceramic magnets are summarized such as magnets in small motors and generators, magnetic clutches, loudspeakers.

The rather short volume of the book, 149 pages, excludes by itself a comprehensive treatment of the whole field of material science and technology of ceramic magnets as it might be expected to be given in a monograph. Rather it is the author's intention to present a brief introductory text. The book is well illustrated by instructive schematic diagrams, pictures of production plants and final magnets as they are being used in technical devices. Furthermore the text is amply corroborated by numerical examples providing the reader with a good idea of the order of magnitude of the treated phenomena.

Besides the table of contents the book contains a list of symbols used in the text as well as an extensive subject index thus enabling the reader to quickly find some special topic. Some eighty references provide further readings for a more extensive study of the subject. In general the book holds what it claims to be a brief introduction to ceramic magnets for the practical engineer.

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