MICROMAGNETISM AND THE MICROSTRUCTURE OF FERROMAGNETIC SOLIDS

The main topic of this book is micromagnetism and microstructure as well as the analysis of the relations between characteristic properties of the hysteresis loop and microstructure. Also presented is an analysis of the role of microstructure in the fundamental magnetic properties (for example magnetostriction or critical behaviour) of crystalline and amorphous alloys. The authors apply the theory of micromagnetism to all aspects of advanced magnetic materials including domain patterns and magnetization processes under the influence of defect structures. Coverage includes modern developments in computational micromagnetism and its application to spin structures of small particles and platelets.

Based on the continuum theory of micromagnetism, the physical principles of modern permanent and soft magnetic materials are covered comprehensively. Magnetization processes in small particles are outlined on the basis of the Landau–Lifshitz–Gilbert equation including the effects of thermal fluctuations. Magnetic aspects of intermetallic compounds, nanocrystalline and amorphous alloys are considered in detail within the framework of nucleation and pinning phenomena. Measurements of high-field susceptibility in the approach to ferromagnetic saturation are shown to be an appropriate method for the analysis of magnetically active microstructures in ferromagnets. To demonstrate the power of the theory of micromagnetism, the authors present many examples showing that theoretical predictions are supported by experimental results.

This book will be of interest to researchers and graduate students in condensed matter physics, electrical engineering and materials science, and to industrial researchers working in the electrotechnical and recording industries.

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