



Hysteresis in Magnetism: For Physicists, Materials Scientists, and Engineers (Electromagnetism)

By Giorgio Bertotti

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Hysteresis in Magnetism: For Physicists, Materials Scientists, and Engineers (Electromagnetism) By Giorgio Bertotti

This book provides a comprehensive treatment of the physics of hysteresis in magnetism and of the mathematical tools used to describe it. **Hysteresis in Magnetism** discusses from a unified viewpoint the relations of hysteresis to Maxwell's equations, equilibrium and non-equilibrium thermodynamics, non-linear system dynamics, micromagnetics, and domain theory. These aspects are then applied to the interpretation of magnetization reversal mechanisms: coherent rotation and switching in magnetic particles, stochastic domain wall motion and the Barkhausen effect, coercivity mechanisms and magnetic viscosity, rate-dependent hysteresis and eddy-current losses. The book emphasizes the connection between basic physical ideas and phenomenological models of interest to applications, and, in particular, to the conceptual path going from Maxwell's equations and thermodynamics to micromagnetics and to Preisach hysteresis modeling.

- The reader will get insight into the importance and role of hysteresis in magnetism; In particular, he will learn:
 - which are the fingerprints of hysteresis in magnetism
 - which are the situations in which hysteresis may appear
 - how to describe mathematically these situations
 - how to apply these descriptions to magnetic materials
 - how to interpret and predict magnetic hysteresis phenomena observed experimentally

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Editorial Review

From the Back Cover

The book provides a comprehensive treatment of the physics of hysteresis in magnetism, and of the mathematical tools used to describe it. The relations of hysteresis to Maxwell's equations, equilibrium and non equilibrium thermodynamics, non-linear system dynamics, micromagnetics and domain theory are discussed from a unified viewpoint. These aspects are then applied to the interpretation of magnetization reversal mechanisms: coherent rotation and switching in magnetic particles, stochastic domain wall motion and the Barkhausen effect, coercivity mechanisms and magnetic viscosity, rate-dependent hysteresis and eddy-current losses. Emphasis is given to the connection between basic physical ideas and phenomenological models of interest to applications, and, in particular, to the conceptual path going from Maxwell's equations and thermodynamics to micro-magnetics and to Preisach hysteresis modeling.

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The book is aimed at: (P) researchers and graduate students in physics, who are interested in magnetism and magnetic materials, and, more generally, in the physics of hysteresis phenomena, (P) materials scientists and engineers working on the development and application of magnetic materials, (S) mathematicians investigating the mathematical structure of hysteresis non-linearities.

About the Author

Giorgio Bertotti is a senior scientist at INRIM, Istituto Nazionale di Ricerca Metrologica (previously known as IEN Galileo Ferraris), in Torino, Italy, where he has been a researcher since 1979. His research interests are in the field of magnetism and magnetic materials, hysteresis modeling, thermodynamics, noise phenomena. He is author of more than 200 scientific articles and of the book "Hysteresis in Magnetism".

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