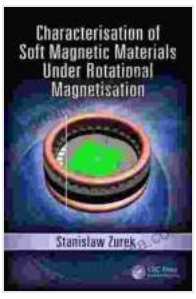
Characterisation of Soft Magnetic Materials Under Rotational Magnetisation: A Comprehensive Guide

Soft magnetic materials are a class of magnetic materials that exhibit high permeability and low coercivity, making them ideal for a wide range of applications in electrical and electronic devices. The magnetic properties of these materials are strongly influenced by their rotational magnetisation, which is the process by which their magnetic moments align with an applied magnetic field.

This article provides a comprehensive guide to the characterisation of soft magnetic materials under rotational magnetisation. We will discuss the different types of rotational magnetisation measurements, the interpretation of hysteresis loops, the determination of core losses, and the application of these measurements in the design of electrical and electronic devices.



Characterisation of Soft Magnetic Materials Under Rotational Magnetisation by Sarah Allen

★★★★★ 5 out of 5

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Types of Rotational Magnetisation Measurements

There are two main types of rotational magnetisation measurements:

* **Static measurements:** These measurements are performed by applying a static magnetic field to the sample and measuring the resulting magnetisation. * **Dynamic measurements:** These measurements are performed by applying a rotating magnetic field to the sample and measuring the resulting magnetisation.

Static measurements are typically used to characterise the magnetic properties of materials at low frequencies, while dynamic measurements are used to characterise the magnetic properties of materials at high frequencies.

Interpretation of Hysteresis Loops

A hysteresis loop is a graph that plots the magnetisation of a material as a function of the applied magnetic field. The shape of the hysteresis loop can provide valuable information about the magnetic properties of the material, including its permeability, coercivity, and remanence.

Figure 1 shows a typical hysteresis loop for a soft magnetic material. The initial slope of the hysteresis loop is proportional to the permeability of the material. The coercivity is the magnetic field required to reduce the magnetisation to zero. The remanence is the magnetisation that remains in the material after the applied magnetic field has been removed.

[Image of a hysteresis loop for a soft magnetic material]

Determination of Core Losses

Core losses are the energy losses that occur in a magnetic material when it is subjected to a changing magnetic field. Core losses can be divided into two main types:

* **Hysteresis losses:** These losses are caused by the irreversible magnetisation and demagnetisation of the material. * **Eddy current losses:** These losses are caused by the flow of eddy currents in the material.

Core losses can be determined by measuring the power dissipated in the material when it is subjected to a changing magnetic field. The core loss is typically expressed in watts per kilogram of material.

Application in the Design of Electrical and Electronic Devices

The characterisation of soft magnetic materials under rotational magnetisation is essential for the design of electrical and electronic devices. The magnetic properties of these materials determine their suitability for a particular application.

Soft magnetic materials are used in a wide range of electrical and electronic devices, including:

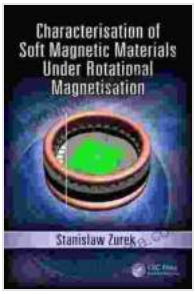
* Transformers * Electric motors * Generators * Inductors * Magnetic sensors

The characterisation of soft magnetic materials under rotational magnetisation allows engineers to select the right material for a particular application and to optimise the design of the device.

The characterisation of soft magnetic materials under rotational magnetisation is a complex but important topic. A thorough understanding of this topic is essential for the design of electrical and electronic devices.

This article has provided a comprehensive overview of the characterisation of soft magnetic materials under rotational magnetisation. We have discussed the different types of rotational magnetisation measurements, the interpretation of hysteresis loops, the determination of core losses, and the application of these measurements in the design of electrical and electronic devices.

We hope that this article has been helpful. If you have any questions, please feel free to contact us.



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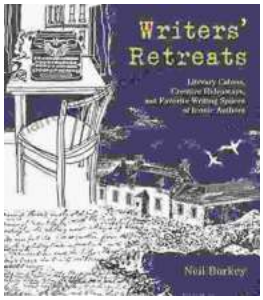

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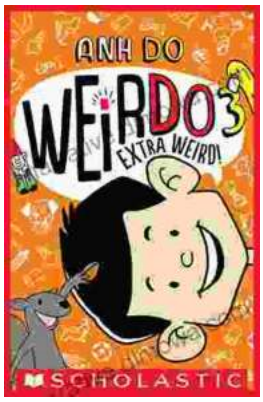

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