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Measurement methods for Curie temperature of magnetic materials - Part 1: Permanent magnetic materials

磁性材料居里温度的测量方法 第1部分：永磁材料

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Table of Contents

1 Scope 1
2 Normative references 1
3 Terms and Definitions 1
4 Determination of Curie temperature measurement 1
5 Data Processing 9

Foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting: This document is part 1 of GB/T 43870 "Measurement method of Curie temperature of magnetic materials": GB/T 43870 has been published in Lower part:

--- Part 1: Permanent magnetic materials;

--- Part 2: Soft magnetic materials: Please note that some of the contents of this document may involve patents: The issuing organization of this document does not assume the responsibility for identifying patents: This document was proposed by the Ministry of Industry and Information Technology of the People's Republic of China: This document is under the jurisdiction of the National Technical Committee for Standardization of Magnetic Components and Ferrite Materials (SAC/TC89): This document was drafted by: China University of Metrology, the Ninth Institute of China Electronics Technology Group Corporation, China Institute of Metrology, Beijing Mining Magnetics Materials Technology Co:, Ltd:, Zhejiang Institute of Metrology, Changsha Tianheng Measurement and Control Technology Co:, Ltd:, Hengdian Group Dongmei Co:, Ltd:, Zhejiang Zhongke Magnetics Co:, Ltd: The main drafters of this document are: Wu Qiong, Ge Hongliang, Wang Zisheng, Peng Qinggui, Gong Wenjie, Liu Rongming, Yu Zhishu, Zhou Xinhua, He Zhenyu, Huang Yihong, Pan Minxiang, Yang Hangfu, and Yu Nengjun:

Curie temperature is the transition temperature of the internal magnetic moment of ferromagnetic/ferrimagnetic materials from order to disorder, that is, the transition temperature between ferromagnetism/ferrimagnetism and order: The temperature at which magnetic properties change is one of the basic characteristics of ferromagnetic materials: Curie temperature measurement is part of magnetic property measurement: GB/T 43870 "Measurement method of Curie temperature of magnetic materials" consists of two parts:

--- Part 1: Permanent magnetic materials: The purpose is to specify the measurement method of the Curie temperature of permanent magnetic materials:

--- Part 2: Soft magnetic materials: The purpose is to specify the measurement method of Curie temperature of soft magnetic materials: Measuring Method of Curie Temperature of Magnetic Materials Part 1: Permanent magnetic materials

1 Scope

GB/T 43870.1-2024 is Part 1 of the Chinese series on measuring the Curie temperature of magnetic materials, and covers permanent magnets. The Curie temperature is the ceiling on everything a magnet can do: the remanence falls as the temperature approaches it and vanishes at it, and for the neodymium-iron-boron magnets that China supplies to the world it is uncomfortably low, which is why the alloys are doped with dysprosium and cobalt and why the measured value is a quality control parameter rather than a textbook constant. The standard sets the determination of what is to be measured and then the measurement itself by two methods - the vibrating sample or coil magnetometer method and the magnetic weighing method - each with its principle, sample, measuring device, reference sample, measurement procedure and data processing, together with the uncertainty and the test report. It took effect on 1 November 2024.

This document describes a method for measuring the Curie temperature of permanent magnetic materials: This document is applicable to the measurement of Curie temperature of AlNiCo permanent magnets, ferrite permanent magnets, FeCrCo permanent magnets, rare earth permanent magnets and other permanent magnet materials:

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document: For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document: GB/T 2900:

60 Electrical terminology - Electromagnetism

GB/T 9637 Electrical terminology magnetic materials and components

GB/T 38437-2019 Method for measuring the magnetic dipole moment of ferromagnetic material samples by pulling or rotating

3 Terms and definitions

The terms and definitions defined in GB/T 2900:60 and GB/T 9637 apply to this document:

4 Determination of Curie temperature measurement value

The curve of the change of magnetic moment m with temperature T (mT curve) is

measured: The tangent line at the point where the absolute value of the slope (dm/dT) of the curve is the maximum is parallel to m=0: The intersection of the horizontal axis, the temperature value here is the Curie temperature, as shown in Figure 1: Index number description: 1

---The tangent line passing through the point where the absolute value of dm/dT is the largest; 2

---dm/dT absolute value maximum point: dm/dT Figure 1: mT curve and Curie temperature TC