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**NATIONAL STANDARD OF THE  
PEOPLE'S REPUBLIC OF CHINA**

**GB/Z 43592.1-2023**

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**Nanotechnologies - Magnetic nanomaterials - Part 1:  
Specification of characteristics and measurements for  
magnetic nanosuspensions**

纳米技术 磁性纳米材料 第1部分：磁性纳米悬浮液的特性和测量规范

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## Foreword

This document complies with the provisions of GB/T 1:1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents" Drafting: This document is Part 1 of GB /Z 43592 "Nanotechnology Magnetic Nanomaterials": GB /Z 43592 has released the following parts:

---Part 1: Characteristics and measurement specifications of magnetic nanosuspensions: This document is equivalent to ISO /T S19807-1:2019 "Nanotechnology Magnetic Nanomaterials Part 1: Magnetic Nanosuspension" "Characteristics and Measurement Specifications", the document type was adjusted from ISO technical specifications to my country's national standardization guiding technical documents: This document has made the following minimal editorial changes:

---Adjusted the order of Table 1 and Table 2;

---Correct "Table 1" in 5:1 to "Table 3";

--- Some reference standards and methods have been added to Table 3;

---Adjusted the order of footnotes and notes in Table 3;

---Modified references: Please note that some content in this document may be subject to patents: The publisher of this document assumes no responsibility for identifying patents: This document is proposed by the Chinese Academy of Sciences: This document is under the jurisdiction of the National Nanotechnology Standardization Technical Committee (SAC/TC279): This document was drafted by: Southeast University, Northwest University, Institute of Basic Medicine, Chinese Academy of Medical Sciences, Nanjing Donna Biotechnology Co., Ltd: company: The main drafters of this document: Zhang Yu, Fan Haiming, Zhao Yang, Dong Haijiao, Wu Haoan, Wen Tao, Ma Ming, Gu Ning, Xu Haiyan, Cui Yan, Zhang Shiyin, Wang Jianguo:

Nanomaterials offer opportunities to develop new technologies at the intersection of

chemistry, physics and biology: Nanomaterials generally refer to at least one Particles, films, self-assembly and etched structures with dimensions in the size range of approximately 1nm~100nm: GB /Z 43592 aims to establish the characteristics and measurement methods of magnetic nanomaterials in different application scenarios in the biomedical field: It is planned to be composed of 4 composed of parts:

---Part 1: Characteristics and measurement specifications of magnetic nanosuspensions: Aim to characterize and measure magnetic nanosuspensions Method, as the basis of the GB/T 43592 series of standards:

---Part 2: Characteristics and measurement methods of nanostructured magnetic beads for nucleic acid extraction: The purpose is to provide the practical application of magnetic nanomaterials in nucleic acid extraction: Take the characteristics and measurement methods in the field:

---Part 3: Characteristics and measurement methods of nanomagnetic beads used in cell sorting: The purpose is to provide magnetic nanomaterials in cell sorting Characteristics and measurement methods in the field:

---Part 4: Characteristics and measurement methods of nanostructured magnetic beads for chemiluminescence detection: The purpose is to provide magnetic nanomaterials in Characteristics and measurement methods in the field of chemiluminescence detection: Magnetic nanosuspension refers to a fluid nanodispersion system in which the solid phase is magnetic nanoparticles: Magnetic nanosuspensions and bulk materials responds to an external magnetic field in the same way: These unique properties have led to the development of new technologies and products: Magnetic nanosuspension consists of 3 parts: magnetic nanoparticles; dispersion medium; dispersant (see Appendix A): Magnetic Nanosuspension It has important potential applications in industrial and medical health fields, such as vacuum sealing, lubricants, coolants, dampers, magnetic soaps, environmental remediation, Medical imaging, drug delivery technology, magnetic hyperthermia, etc: In order to meet the needs of the rapidly developing application market, there is an urgent need to develop special solutions for these suspensions: Sexuality provides a common definition and measurement method: Nanotechnology Magnetic Nanomaterials Part 1: Characteristics of magnetic nanosuspensions and Measurement specifications

## 1 Scope

GB/Z 43592.1-2023 characterises magnetic nanosuspensions - magnetic nanoparticles held dispersed in a liquid. They are the working form of the material in most of its applications: as contrast agents and hyperthermia agents in medicine, as the separation medium in magnetic bioassays, as ferrofluids in seals and dampers. What determines whether a suspension performs is not the bulk magnetic property of the material but a combination of things that are awkward to measure and easy to misreport - the particle size

distribution as it exists in the liquid rather than as a dry powder, the magnetisation per unit of magnetic material, the coating that keeps the particles apart, and above all the colloidal stability, since a suspension whose particles aggregate has changed into a different material without any change in its stated composition. This part specifies the characteristics of magnetic nanosuspensions and describes the measurement methods for them. It is a general document and does not address any particular application. As a GB/Z it is a guiding technical document. Under ICS 07.030 and CCS A40, it is written for nanomaterial producers, medical and diagnostic developers, and analytical laboratories.

This document specifies the characteristics of magnetic nanosuspensions and describes measurement methods: This document is a general document and does not address any specific application:

## 2 Normative reference documents

This document has no normative references:

## 3 Terms and definitions

The following terms and definitions apply to this document: The ISO and IEC terminology databases are accessed via:

---ISO :<http://www.iso.org/obp> 3:1 AC susceptibility AC susceptibility The complex ratio of the dynamic magnetization to the applied magnetic field:

Note 1: The dynamic magnetization intensity is  $M = M_0 e^{i(2\pi f t - \phi)}$ , and the external magnetic field is  $H = H_0 e^{i(2\pi f t)}$ : AC magnetic susceptibility  $\chi = M/H$  is divided into in-phase components (real part) And the non-phase component (imaginary part):  $\chi = \chi' - i\chi''$ :

Note 2: Depending on the type of magnetization used, the AC susceptibility of the material is related to the volume, mass or quantity of the material: AC volume magnetic susceptibility:  $\chi_v = M_0 V / H_0 \cos \phi - i M_0 V / H_0 \sin \phi$  AC mass magnetic susceptibility:  $\chi_m = M_0 m / H_0 \cos \phi - i M_0 m / H_0 \sin \phi$  AC molar susceptibility:  $\chi_n = M_0 n / H_0 \cos \phi - i M_0 n / H_0 \sin \phi$

Note 3: AC magnetic susceptibility depends on the excitation field frequency and temperature and should also be noted:

Note 4: The amplitude of the excitation field should be small enough to ensure a linear relationship between the amplitude of the dynamic magnetization and the amplitude of the applied AC field: 3:2 agglomerate An aggregate of weakly or moderately bound particles has a surface area similar to the sum of the surface areas of individual particles:

Note 1: The forces holding the agglomerates together are weak forces, such as van der Waals forces or simple physical entanglement:

Note 2: Agglomerates are also called secondary particles, while source particles are called primary particles:

Note 3: The primary particles themselves can be composite particles with magnetic and non-magnetic parts: [Source: ISO /T S80004-2:2015,3:4]

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