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BSI Standards Publication

Nanotechnologies — Magnetic nanomaterials

Part 1: Specification of characteristics and measurements for magnetic nanosuspensions

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Nanotechnologies - Magnetic nanomaterials - Part 1: Specification of characteristics and measurements for magnetic nanosuspensions (ISO/TS 19807-1:2019)

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European foreword

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Nanotechnologies — Magnetic nanomaterials —

Part 1: Specification of characteristics and measurements for magnetic nanosuspensions

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Partie 1: Spécification des caractéristiques et des mesures pour les nanosuspensions magnétiques

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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Introduction

Nanomaterials offer the opportunity for new technologies at the interfaces between chemistry, physics and biology. The term nanomaterial is used to refer to a wide range of particles, thin films, self-assembling and lithographically produced structures in which at least one dimension is less than 100 nm. Magentic nanosuspensions are fluid nanodispersion, where the solid phase is formed by magnetic nanoparticles.Magnetic nanosuspensions and bulk materials react to applied magnetic fields in different ways. These unique properties enable the development of innovative technologies and products.

Magnetic nanosuspensions have important potential industrial and healthcare applications such as vacuum seals, lubricants, coolants, dampers, magnetic soaps, environmental remediation, medical imaging, drug delivery technologies, magnetic hyperthermia therapy, etc. To satisfy the demands of rapidly accelerating application markets, there is a strong need to provide universal definitions and measurement methods for the characteristics of these suspensions. There are three components of a magnetic nanosuspension: (1) magnetic nanoparticles (2) dispersing medium and (3) dispersant (Annex A).

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Nanotechnologies — Magnetic nanomaterials —

Part 1: Specification of characteristics and measurements for magnetic nanosuspensions

1 Scope

This document specifies the characteristics of magnetic nanosuspensions to be measured and lists measurement methods for measuring these characteristics.

This is a generic document and does not deal with any particular application.

2 Normative references

There are no normative references for this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
AC susceptibility
complex ratio between the dynamic magnetization and the applied magnetic excitation field

Note 1 to entry: The dynamic magnetization is given as $M = M_0 \mathrm{e}^{(i2\pi \mathrm{ft} - \phi)}$ and the applied magnetic excitation field is given as $H = H_0 \mathrm{e}^{i2\pi \mathrm{ft}}$. The AC susceptibility $\chi = \mathrm{M} / \mathrm{H}$ is divided into an in-phase component (real part) and an out-of-phase component (imaginary part): $\chi = \chi' - i\chi''$.

Note 2 to entry: In dependence on the type of magnetization that is used, the AC susceptibility of a material is related to volume, mass or amount of the material.

AC volume susceptibility $\chi_{\mathrm{V}} = \frac{M_{0\mathrm{V}}}{H_0}\cos\varphi - i\frac{M_{0\mathrm{V}}}{H_0}\sin\varphi$

AC mass susceptibility $\chi_{\mathrm{m}} = \frac{M_{0\mathrm{m}}}{H_0}\cos\varphi - i\frac{M_{0\mathrm{m}}}{H_0}\sin\varphi$

AC molar susceptibility $\chi_{\mathrm{n}} = \frac{M_{0\mathrm{n}}}{H_0}\cos\varphi - i\frac{M_{0\mathrm{n}}}{H_0}\sin\varphi$

Note 3 to entry: AC susceptibility depends on the excitation field frequency and the temperature, which should also be indicated.

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