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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 21115-2007

Measurement of the levitation force of bulk oxide superconductors

块状氧化物超导体磁浮力的测量

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Foreword

Given China's current superconducting Maglev block material mainly used to make magnetic levitation device, and more urgent need for standardized methods for measuring superconductors Force, so the development of this standard. The International Organization for Standardization and standards related to superconductivity is the International Electrotechnical Commission Technical Committee (IEC -TC90). Appendix A of this standard is an informative annex. This standard by the National Superconducting technology joint research and development center proposed, the National Standardization Technical Committee under the jurisdiction of superconductivity. This standard is drafted by: Beijing Nonferrous Metal Research Institute and the National Superconducting technology joint research and development centers. Participated in the drafting of this standard. Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences Institute of Physics, Northwest Ferrous metals Research Institute, the Institute of Electrical Engineering. The main drafters of this standard. Xiao Ling, Jiao Yulei, Zheng Minghui, Zhang, Liu Yiping, Liu Guodong, Zhang Cuiping, Chumin. This standard is the first release. Measuring bulk oxide superconductor magnetic levitation force

1 Scope

China's national method for measuring the magnetic levitation force of bulk oxide superconductors. It specifies the method for measuring the levitation force of large-grain bulk oxide superconductors at liquid nitrogen temperature, near 77 K, and it applies to the axial levitation force of melt-textured cylindrical rare earth barium copper oxide superconductors. A bulk high-temperature superconductor levitates a magnet, or is levitated by one, and does so stably without any control system - which is what distinguishes it from every other magnetic suspension. An ordinary magnet cannot be suspended stably above another magnet; a superconductor can, because flux lines penetrating it are pinned by defects in the material and resist being moved in any direction, so the object is trapped rather than balanced. That property makes bulk superconductors the basis of superconducting bearings, flywheel energy storage, and the maglev demonstrations for which China has particular use. The levitation force is the figure of merit of such a material, and it is not a fundamental property but a measured one: it depends on the pinning

strength, on the grain structure produced by melt texturing, on the geometry, on the field the magnet produces and on the history of how the superconductor was cooled and approached. So a number quoted without its conditions means nothing, and this standard exists to fix them. It specifies the magnet and its field, the cooling procedure - whether zero-field cooled or field cooled, which changes the result substantially - the approach and separation distances and the rate, the measurement of force, and the reporting. Issued on 11 October 2007 and in force since 1 December 2007.

This standard specifies the test block large grain oxide superconductors (abbreviated massive superconductor) at liquid nitrogen temperature (77K) near Magnetic Force method. This standard applies to the measurement prepared by the melt-textured growth cylindrical RE-Ba-Cu-O superconductor axial magnetic levitation force of the superconductor Diameter less than or equal to 50mm. Cylindrical superconducting block diameter larger than 50mm and the other having a regular shape (cube, cuboid, was sixty Prisms, etc.) measure the axial force superconducting maglev blocks and non-axial magnetic levitation force may also refer to this standard.

2 Normative references

The following documents contain provisions adopted in this standard references to the Terms constitute standards. For cited documents with dates, with its After all of the amendments (not including errata content) or revisions do not apply to this standard, however, encourage each agreement in accordance with this standard Are Prescriptions can use the latest versions of these documents. For undated reference documents, the latest versions apply to this standard.

GB/T 13811-2003 Electrotechnical terminology superconductivity (IDT

IEC 60050-815.2000. Electrotechnicalterminolo- gy-Superconductivity)

JJF1059-1999 Evaluation and Expression of Uncertainty in Measurement

3 Terms and Definitions

GB/T 13811, JJF1059 established as well as the following terms and definitions apply to this section.

3.1 Under certain conditions exhibit superconductivity compound contains oxygen as an essential component of a superconductor. NOTE. Always refer to the appropriate conditions of temperature, magnetic field strength and the current density. [GB/T 13811-2003 in 815-02-05]

3.2 Containing copper oxide superconductor layered structure of surface oxygen. [GB/T 13811-2003 in 815-02-08]

3.3 Partially melted at high temperatures after solidification, to prepare a good orientation of

the oxide superconductor technology. [GB/T 13811-2003 in 815-05-22]

3.4 In determining the gap between the lower temperature and determine the interaction force generated between bulk superconductor and magnet Newtons (N). The superconducting The interaction between the body and the magnet of history and state, magnetic force can be attractive or repulsive force. Take certain conditions (magnetic and cooling) and the minimum distance measurable repulsion (0.1mm) under the sample under the conditions The maximum repulsive force. Take the maximum under certain conditions (magnetic and cooling) measured the attractiveness of the biggest attraction in the sample under this condition.

3.5 Acting on the basis of the end face of the superconductor maglev force in Newtons per square centimeter (N/cm2).