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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 41641-2022

Mechanical properties measurement - Room temperature tensile test on REBCO wires

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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 identically adopts IEC 61788-25.2018 "Superconductivity Part 25.Mechanical properties measurement REBCO strip room temperature tensile Tensile Test Method".

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The following minimal editorial changes have been made to this document.

--- In order to coordinate with existing standards, change the name of the standard to "Mechanical Properties Measurement of REBCO Strip Tensile Test Method at Room Temperature";

--- The formula (3) in IEC 61788-25.2018 was amended and "x10-3" was added.

Please note that some contents of this document may refer to patents. The issuing agency of this document assumes no responsibility for identifying patents.

This document was proposed by the Chinese Academy of Sciences.

This document is under the jurisdiction of the National Superconducting Standardization Technical Committee (SAC/TC265).

This document is drafted by. Shanghai Superconducting Technology Co., Ltd., Shanghai Jiaotong University, Western Superconducting Materials Technology Co., Ltd.,

Institute of Plasma Physics, Chinese Academy of Sciences, Suzhou Institute of Advanced Materials Co., Ltd., Lanzhou University, Institute of Electrical Engineering, Chinese Academy of Sciences, Shanghai

Shangchuang Superconducting Technology Co., Ltd., Institute of Physics, Chinese Academy of Sciences, Shanghai University.

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Introduction

Several types of composite superconductors are now commercially available. Rare earth-based oxide superconductors (SC) with the chemical formula REBa2Cu3O7 can be used for

To prepare practical superconducting strips, wherein the rare earth element RE is usually Y, Dy, Gd, Nd, Ho or Sm, or a combination of two or more of these elements

combine. Such practical superconducting tapes are often referred to as REBCO coated conductors. Typical structures of coated conductors include Ni-Cr-Mo based alloys,

Ni-W alloy or stainless steel substrate, buffer layer composed of various oxides, superconducting layer and silver protective layer. Among them, the substrate and buffer layer are conducive to

Formation of biaxial textures in superconducting layers. In order to withstand large electromagnetic forces, stainless steel or copper alloy thin strips are usually used to encapsulate and strengthen the coated conductor.

Commercial composite superconductors have high current densities and small cross-sectional areas, and are mainly used in power devices and superconducting magnets. When electrical equipment is manufactured and

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During operation, composite superconducting tapes are subject to complex stresses and strains. In a superconducting magnet, since the coil is in a high magnetic field and carries a high current density

The superconducting coil will be subjected to a large electromagnetic force. Therefore, it is necessary to test the mechanical properties of REBCO superconducting tapes.

Mechanical property measurement

Tensile test method for REBCO strip at room temperature

1 Scope

This document describes a method and procedure for tensile testing of REBCO strip at room temperature. The test methods described in this document apply to

It is used to measure elastic modulus and 0.2% specified plastic elongation strength. The data of elastic limit, breaking strength and elongation after break are for reference only.

This document is suitable for testing rectangular cross-section samples with a cross-sectional area of 0.12mm2~6.0mm2 (corresponding to a width of 2.0mm~

12.0mm, superconducting tape with a thickness between 0.06mm and 0.5mm).

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2 Normative references

The contents of the following documents constitute the essential provisions of this document through normative references in the text. Among them, dated references

For documents, only the version corresponding to the date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to

this document.

ISO 376 Calibration of standard dynamometers for the inspection of uniaxial testing machines for metallic materials (Metalicmaterials-Calibrationof

Note. GB/T 13634-2019 Calibration of standard dynamometers for inspection of uniaxial testing machines for metallic materials (ISO 376.2011, IDT)

ISO 7500-1 Inspection of static uniaxial testing machines - Part 1.Inspection and calibration of force measuring systems of tensile and (or) compressive testing machines

Note. GB/T 16825.1-2008 Inspection of static uniaxial testing machines - Part 1.Inspection and calibration of force measuring systems of tensile and (or) compressive testing machines

(ISO 7500-1.2004, IDT)

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ISO 9513 Calibration of extensometer systems for uniaxial testing of metallic materials (Metalicmaterials-Calibrationofexten-

Note. GB/T 12160-2019 Calibration of Extensometer System for Uniaxial Testing of Metallic Materials (ISO 9513.2012, IDT)

3 Terms and Definitions

The following terms and definitions apply to this document as defined by the IEC and ISO online platforms.

The following are the URLs of the term bases maintained by ISO and IEC for standardization work.

3.1

Tensile stress tensile stress

The quotient of the tensile force at any time during the test divided by the original cross-sectional area of the specimen.

3.2

Tensile strain tensile strain

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