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GB/T 43853-2024

**Test of high temperature friction and wear properties of laser
repairing coatings - Ball-on-disc method**

激光修复层高温摩擦磨损性能试验 球-盘法

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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: 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 China Machinery Industry Federation: This document is under the jurisdiction of the National Laser Repair Technology Standardization Technical Committee (SAC/TC482): This document was drafted by: Shenyang University, Shenyang Continental Laser Technology Co., Ltd., Hubei University of Technology, Shenyang Aerospace University, Shenyang University of Science and Technology, Institute of Metal Research, Chinese Academy of Sciences, Shenyang Foundry Research Institute Co., Ltd., China Machinery Engineering Institute Group, Shanghai Institute of Electric Power, Shanghai Jiaotong University Tong University, Nanchang Hangkong University, Shanghai Continental Tianrui Laser Surface Engineering Co., Ltd., China Aero Engine Commercial Aircraft Engine Co., Ltd., Baowu Equipment Intelligent Technology Co., Ltd., Baoshan Iron & Steel Co., Ltd., Yueyang Continental Laser Technology Co., Ltd., Nanjing University of Aeronautics and Astronautics, Xi'an Shaangu Power Co., Ltd., Tai'an Quality and Technical Inspection and Testing Institute, Jilin University, State-owned Sichuan West Machinery Factory, Shanghai Shipbuilding Industry Corporation Art Institute: The main drafters of this document are: He Chunlin, Chen Jiang, Tan Haifeng, Lou Deyuan, Hui Li, Wang Wei, Zhang Song, Yao Ge, Wang Wen, He Younian, Zhou Song, Liu Yu, Yang Guang, Ma Guofeng, Liu Yan, Wu Chenliang, Xie Huasheng, Li Lei, Feng Kai, Peng Xiao, Qian

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Laser repair technology is an advanced surface engineering technology that is widely used in industries such as metallurgy, petrochemicals, electricity, and ships: A large number of laser repaired parts are used in high temperature friction environments, such as continuous casting equipment, hot rolling equipment and power equipment in the metallurgical field: The evaluation of high temperature friction and wear performance of this laser repair layer is particularly important: The ball-on-disc configuration is the most common high-temperature friction and wear test machine type, which is widely used in scientific research and product performance evaluation: Due to the lack of relevant standards, the current high-temperature friction and wear test equipment, test procedures, test parameters, test result processing, etc: are not fully The same often leads to large differences in test data obtained by different personnel, making them difficult to compare: Obviously, this will cause great difficulties for scientific research and engineering development: It brings great confusion to the personnel and even causes serious engineering misjudgment: High temperature wear resistance and engineering of laser repair layers (such as iron, nickel, cobalt-based and their composite materials) based on a large number of high temperature friction conditions This document was developed through industry-university-research cooperation: The main purpose is to standardize the test method for determining the high temperature wear resistance of laser repair layers by the ball-on-disk method: The laser repair layer is often inhomogeneous: structure (density change), and during the test, the repair layer will inevitably experience high temperature oxidation, wear debris adhesion, etc: This document stipulates that based on the wear The wear resistance is characterized by volume rather than wear mass measurements to avoid the problem of poor correlation of wear test data: The test results obtained according to this document can provide data for evaluating the service safety of laser repaired metal parts under high temperature friction conditions: The formulation of this document will promote the technological innovation of laser repair enterprises and the establishment of product quality systems, and promote the development of laser repair technology in my country: It plays a positive role in the development and engineering application: Laser repair layer high temperature friction and wear Performance test ball-disc method

1 Scope

GB/T 43853-2024 gives the ball-on-disc test for the friction and wear behaviour of laser repair coatings at high temperature. Laser cladding is now the standard way of rebuilding worn turbine, mould and shaft surfaces in China, and the repaired part goes back into service hot, where the coating's wear behaviour is governed by oxide formation rather than by its room temperature hardness - so the ranking of coatings at 20 degrees can invert at 600. The standard sets the principle, the test conditions, the materials and reagents, the

instruments and equipment including the ball-on-disc apparatus, the stereo microscope, the microscope and the contact profilometer, the specimens with the requirements for the ball and the disc, and the test procedure, followed by the calculation of the friction coefficient and the wear rate from the wear track profile, and the test report. It took effect on 25 April 2024.

This document describes the test method for the elevated temperature friction and wear performance of laser repaired layers using the ball-on-disc method: This document is applicable to the determination of the heat transfer between laser repair layers or between one laser repair layer and another by the ball-disk method under the conditions of 35°C~1000°C: Test for wear resistance and friction generated by coaxial sliding contact between other 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 678 Chemical reagent ethanol (anhydrous ethanol)

GB/T 686 Chemical reagent acetone

GB/T 6062 Product Geometry Specification (GPS) Nominal characteristics of contact (stylus) instruments using the surface structure profile method

GB/T 8170 Rules for rounding off values and expression and determination of limit values

GB/T 17754 Tribological terms GB/T 19864:

3 Terms and definitions

The terms and definitions defined in GB/T 17754 and GB/T 29795 and the following apply to this document: 3:

1 Using laser repair technology, a surface coating that is metallurgically bonded to the substrate is formed on the surface of damaged parts: 3:

2 Wear test Methods for assessing the friction and wear properties of materials in sliding contact: [Source: ISO 20808:2016, 3:2] 3:

3 Specific wear rate Material removal rate due to wear:

Note: The wear volume V (mm³) is expressed by the unit normal force F (N) and the unit sliding distance L (m): The relationship is: $Ws = V/(F \times L)$, and the unit is cubic Square

millimeter per Newton meter [$\text{mm}^3/(\text{N}\cdot\text{m})$]:

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