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

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**Diamond-like carbon films - Determination of friction and wear
characteristics of diamond-like carbon films by ball-on-disc
method**

类金刚石薄膜球盘法测试类金刚石薄膜的摩擦磨损性能

(English Translation)

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Table of Contents

Preface
Introduction
1 Scope
2 Normative references
3 Terms and Definitions
4 Test materials and sample preparation
5 Instruments and Equipment
6 Testing Process
7 Test result calculation
8 Test Report
Appendix A (informative) Structural changes of this document compared with ISO 18535:2016
Appendix B (Informative) Measurement uncertainty for calculating the friction coefficient
Reference

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 is modified to adopt ISO 18535:2016 "Testing the Friction and Wear Properties of Diamond-Like Carbon Films by the Ball-on-Disk Method".

Compared with ISO 18535:2016, this document has more structural adjustments. The structural number changes between the two documents are shown in the table below.

See Appendix A.

The technical differences between this document and ISO 18535:2016 and their reasons are as follows.

--- Increased the scope of application (see Chapter 1);

--- Replaced ISO 3290-1 (see 4.2) with the normative reference GB/T 308.1, replaced with the normative reference GB/T 308.2 ISO 3290-2 (see 4.2) was replaced by ISO 1101 (see 4.3) with the normative reference GB/T 1182.

GB/T 6062 replaces ISO 3274 (see 5.2.4) to adapt to my country's technical conditions;

--- Added normative references GB/T 17754 (see Chapter 3); Added normative references GB/T 10610 (see 4.1~4.3) to adapt to my country's technical conditions;

--- The definitions of the terms wear and wear rate (see 3.1, 3.6, 3.1, 3.6 of ISO 18535:2016) have been changed to adapt to the technical requirements of my country.

condition;

--- Deleted the scope of application of the ball-disc method, clarified the requirements for ball and disc specimens, and added other requirements for materials (see 4.1, 4.1 of ISO 18535:2016) to adapt to my country's technical conditions;

--- Deleted the normative references ISO 4287 (see 4.2, 4.3 of ISO 18535:2016), ISO 80000-1:2009 (see 7.4 of ISO 18535:2016) to adapt to my country's technical conditions;

--- Added the measurement purpose of micrometer, microscope and stylus profile measuring instrument (see 5.2.1) to adapt to my country's technology condition;

--- Added the recommended setting value of the sensitivity of the stylus profilometer (see 5.2.4);

--- Deleted the recommended setting value for the sensitivity of the wear measurement device (see 5.6 of ISO 18535:2016);

--- Added normative references GB/T 3101 (see 7.4) to adapt to my country's numerical rounding rules.

The following editorial changes were made to this document.

--- Added the explanation of formula symbols in Appendix B.

Introduction

This document provides guidance on ball-on-disk sliding friction and wear testing of diamond-like carbon (DLC) films to determine the properties of diamond-like carbon (DLC) films and Friction and wear generated by the wearing parts in uniaxial sliding contact.

The tribological properties of DLC films are different from those of metal and ceramic films. Compared with other materials, DLC films have low friction coefficient and low Wear characteristics. Since DLC film is a thin film material rather than a bulk material, it has limited wear and delamination potential.

Therefore, a friction and wear test method specifically for DLC films was used to determine the friction and wear properties independent of delamination.

There are three options for testing using the ball-on-disk method. pairing a DLC film ball with a non-film disk, pairing a non-film ball with a DLC film disk, and pairing a DLC film with a non-film disk.

In contrast, depositing a DLC film on a ball sample and pairing it with a non-film disk can more accurately measure at the same time, the wear of the ball leads to a decrease in contact pressure, which will also be reflected in the change of the friction coefficient. For the above reasons, the ball-on-disk method is Ideal for routine testing of DLC films.

It is important to note that there are many parameters in sliding contact that affect the friction and wear results. The goal of any wear test is to Simulate the conditions in the actual application. As the deviation between the test conditions and the application conditions increases, the relevance of the test results decreases.

Increase the reliability of the test results by comparing the wear surface appearance of the test sample with the wear surface appearance of the actual worn part to ensure in each case similar wear occurred. The purpose of this document is to provide a general comparison of materials when the application conditions are not clear but a general comparison of materials is required.

When using the test conditions recommended in this document.

Diamond-like carbon film ball-on-disk method test Friction and wear properties of diamond-like carbon films

1 Scope

This document describes the ball-on-disk method test method for determining the coefficient of friction and wear rate of diamond-like carbon (DLC) films.

This document is applicable to the friction and wear performance test of DLC film under dry friction conditions, not applicable to the friction and wear performance test of DLC film under lubricated conditions.

Friction and wear performance test.

2 Normative references

The contents of the following documents constitute 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 308.1 Rolling bearing balls Part 1: Steel balls (GB/T 308.1-2013, ISO 3290-1:2008, NEQ) GB/T 308.2 Rolling bearing balls Part 2: Ceramic balls (GB/T 308.2-2010, ISO 3290-2:2008, IDT) GB/T 1182 Product Geometric Specification (GPS) Geometric Tolerances Shape, Orientation, Position and Runout Tolerances (GB/T 1182-2018, ISO 1101:2017, MOD) GB/T 3101 General principles for quantities, units and symbols GB/T

6062 Product Geometry Specification (GPS) Nominal characteristics of surface structure profile contact (stylus) instruments (GB/T 6062-2009, ISO 3274:1996, IDT) GB/T 10610 Geometric Product Specification (GPS) Rules and methods for evaluating surface structure by surface structure profile method GB/T 17754 Tribology Terminology ISO 3611 Geometrical product specifications (GPS) Design and metrological characteristics of micrometers for external measurements of dimensional measuring equipment [Ge-metricproductspecifications(GPS)-Dimensionalmeasuringequipment-Designandmetrological characteristicsofmicrometersforexternalmeasurements] ISO 13385-1 Geometrical Product Specifications (GPS) Dimensional Measuring Equipment Part 1: Design and Metrological Characteristics of Calipers [Ge-metricproductspecifications(GPS)-Dimensionalmeasuringequipment-Part 1: Designandme-troologicalcharacteristicsofcalipers]

3 Terms and definitions

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

Wear

The phenomenon and process of surface deformation, damage or gradual loss of surface material due to friction.

Wear test

Evaluation method of friction and wear properties of materials in sliding contact.