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Fine ceramics (advanced ceramics, advanced technical ceramics) — Determination of friction and wear characteristics of monolithic ceramics by ball-on-disc method

Céramiques techniques — Détermination des caractéristiques de frottement et d'usure des céramiques monolithiques par la méthode "bille sur disque"

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 206, *Fine ceramics*.

This second edition cancels and replaces the first edition (ISO 20808:2004), which has been technically revised.

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Fine ceramics (advanced ceramics, advanced technical ceramics) — Determination of friction and wear characteristics of monolithic ceramics by ball-on-disc method

1 Scope

This document specifies a procedure for and provides guidance on the determination of the coefficient of friction and the specific wear rate for monolithic ceramics. In this method, the materials are tested in pairs, in a ball-on-disc configuration, under dry, non-abrasive conditions.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1101, *Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

ISO 3274, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Nominal characteristics of contact (stylus) instruments*

ISO 3611, *Geometrical product specifications (GPS) — Dimensional measuring equipment: Micrometers for external measurements — Design and metrological characteristics*

ISO 4287, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*

ISO 13385 (all parts), *Geometrical product specifications (GPS) — Dimensional measuring equipment*

ISO 80000-1, *Quantities and units — Part 1: General*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

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:

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

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

3.1
wear
alteration of a solid surface by progressive loss or progressive displacement of material due to relative motion between that surface and a contacting substance or substances

3.2
wear test
method of evaluating the friction and wear performance of materials in sliding contact

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3.3
ball-on-disc method
wear test method in which the sliding contact is brought about by pushing a ball specimen on to a rotating disc specimen under a constant load

3.4
friction force
resisting force tangential to the interface between two bodies when, under the action of an external force, one body moves or tends to move relative to the other

3.5
coefficient of friction
μ
dimensionless ratio of the friction force between the two bodies, F_f, to the normal force, F_p, pressing these bodies together

$$\mu = \frac{F_f}{F_p}$$

3.6
specific wear rate
W_s
rate of material removal by wear defined as the quotient of wear volume, V, and the product of normal force, F_P, and sliding distance, L

$$W_s = \frac{V}{(F_P \times L)}$$

4 Significance and use

This document gives guidance on conducting a sliding friction and wear test in a ball-on-disc configuration. It shall be used to determine the wear resistance and friction generated in uniaxial sliding contacts between ceramics.

It should be noted that there are many parameters in sliding contact that affect the magnitude of friction and wear. The aim of performing any wear test is to simulate, as closely as possible, the conditions that occur in the real application. As the deviation between the test conditions and the application conditions becomes larger, the test results become less relevant. To add credence to the test results, the appearance of the worn surfaces from the test samples shall be compared with the appearance of the worn surface from the actual worn component in order to ensure that similar wear mechanisms have taken place in each case.

The recommended test conditions suggested in this document shall be used when the application conditions are not well defined but general comparison among materials is required.

5 Test materials and specimen preparation

5.1 Materials

This test method can be applied to a variety of materials. The only requirement is that ball and disc specimens having the dimensions specified below can be prepared, and that they shall withstand the stresses imposed during the testing without failure or excessive flexure. In principle, the ball and disc specimen should be from the same material, but ball and disc specimens from different materials can also be tested by this method. Any pertinent details of the materials such as their dimensions, surface finish, material type, composition, microstructure and processing treatments shall be reported.

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