International Standard

ISO 17947-1

First edition
2026-10

Fine ceramics (advanced ceramics, advanced technical ceramics) — Methods for chemical analysis of silicon nitride powders —

Part 1: Wet chemical methods, X-ray fluorescence (XRF) using the fused cast-bead method, carrier-gas hot extraction (CGHE) and combustion methods

Céramiques techniques — Méthodes pour l'analyse chimique de poudres de nitrure de silicium —

Partie 1: Méthodes chimiques par voie humide, fluorescence de rayons X (XRF) utilisant la méthode de la perle fondue, extraction à chaud sous gaz vecteur (CGHE) et méthodes de combustion

Reference number
ISO 17947-1:2026(en)

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Published in Switzerland

Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **2**
4 Analytes and ranges **2**
5 Preparation of test sample **2**
5.1 General 2
5.2 Sampling 2
5.3 Drying 2
5.4 Weighing 3
6 Apparatus and reagents **3**
7 Blank test **3**
8 Determination of silicon **3**
8.1 Classification of determination methods 3
8.2 Fusion-dehydration/insolubilization separation-gravimetry and ICP-OES 3
8.2.1 Principle 3
8.2.2 Reagents 3
8.2.3 Apparatus and instruments 4
8.2.4 Procedure 4
8.2.5 Blank test 5
8.2.6 Calibration 5
8.2.7 Calculation 5
8.3 XRF using fused cast-bead method 5
9 Determination of nitrogen **6**
9.1 Classification of determination methods 6
9.2 Acid pressure decomposition-distillation separation-acidimetric titration method 6
9.2.1 Principle 6
9.2.2 Reagents 6
9.2.3 Apparatus 7
9.2.4 Procedure 10
9.2.5 Recovery measurement 11
9.2.6 Calculation 11
9.3 Inert gas fusion-thermal conductivity method 11
9.4 Fusion-ammonia separation-acidimetric titration method 14
10 Determination of aluminium, iron, and calcium **14**
10.1 Principle 14
10.2 Reagents 14
10.3 Apparatus 14
10.4 Procedure 15
10.5 Blank test 15
10.6 Calibration 15
10.7 Calculation 15
11 Determination of oxygen **16**
11.1 Principle 16
11.2 Reagents 16
11.3 Apparatus 16
11.4 Instrument 16
11.5 Procedure 16
11.6 Blank test 16

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11.7 Calculation of calibration coefficient 17
11.8 Calculation 17
12 Determination of carbon 17
12.1 Classification of determination methods 17
12.2 Combustion (induction furnace)-IR absorption spectrometry 18
12.2.1 Principle 18
12.2.2 Reagents 18
12.2.3 Apparatus 18
12.2.4 Instrument 18
12.2.5 Procedure 19
12.2.6 Blank test 19
12.2.7 Calculation of calibration coefficient 19
12.2.8 Calculation 20
12.3 Combustion (resistance furnace)-coulometry 20
12.4 Combustion (resistance furnace)-thermal conductivity 20
13 Determination of fluorine and chlorine 20
13.1 Principle 20
13.2 Reagents 20
13.3 Apparatus 21
13.4 Procedure 21
13.4.1 Extraction of fluorine and chlorine from the sample 21
13.4.2 Determination of fluorine and chlorine 21
13.5 Blank test 22
13.6 Calibration 22
13.7 Calculation 22
14 Reporting analytical values 23
14.1 Number of analyses 23
14.2 Evaluation of analytical values 23
14.3 Expression of analytical values 23
15 Test report 23
Annex A (informative) **List of commercial certified reference materials 25**
Annex B (informative) **Analytical results obtained from a round robin test 26**
Annex C (informative) **Spectral lines for ICP-OES 30**
Bibliography 31

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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 document 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 of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 206, *Fine ceramics,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 184, *Advanced technical ceramics,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 17947-1 cancels and replaces ISO 17947:2014, which has been technically revised.

A list of all parts in the ISO 17947 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document has been developed from Japanese Industrial Standard JIS R 1603:2007[1] with reference to CEN ENV 14226:2002[2] and ASTM C1494-01:2007[3], and is applicable to the chemical analysis of silicon nitride raw powders for fine ceramics use. This document covers both major and minor constituents, such as silicon, nitrogen, and some trace metallic and non-metallic elements.

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Fine ceramics (advanced ceramics, advanced technical ceramics) — Methods for chemical analysis of silicon nitride powders —

Part 1:
Wet chemical methods, X-ray fluorescence (XRF) using the fused cast-bead method, carrier-gas hot extraction (CGHE) and combustion methods

1 Scope

This document specifies methods for the determination of silicon, nitrogen, aluminium, iron, calcium, oxygen, carbon, fluorine, and chlorine in silicon nitride powders.

This document is applicable for the chemical analysis of silicon nitride powders used as raw material for fine ceramics.

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 2828, *Aluminium oxide primarily used for the production of aluminium — Determination of fluorine content — Alizarin complexone and lanthanum chloride spectrophotometric method*

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 6353-1, *Reagents for chemical analysis — Part 1: General test methods*

ISO 6353-2, *Reagents for chemical analysis — Part 2: Specifications — First series*

ISO 6353-3, *Reagents for chemical analysis — Part 3: Specifications — Second series*

ISO 8656-1, *Refractory products — Sampling of raw materials and unshaped products — Part 1: Sampling scheme*

ISO 21068-2:2024, *Chemical analysis of raw materials and refractory products containing silicon-carbide, silicon-nitride, silicon-oxynitride and sialon — Part 2: Determination of volatile components, total carbon, free carbon, silicon carbide, total and free silicon, free and surface silica*

ISO 21068-3:2024, *Chemical analysis of raw materials and refractory products containing silicon-carbide, silicon-nitride, silicon-oxynitride and sialon — Part 3: Determination of nitrogen, oxygen and metallic and oxidic constituents*

ISO 21438-2, *Workplace atmospheres — Determination of inorganic acids by ion chromatography — Part 2: Volatile acids, except hydrofluoric acid (hydrochloric acid, hydrobromic acid and nitric acid)*

ISO 21438-3, *Workplace atmospheres — Determination of inorganic acids by ion chromatography — Part 3: Hydrofluoric acid and particulate fluorides*

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ISO 26845:2008, *Chemical analysis of refractories — General requirements for wet chemical analysis, atomic absorption spectrometry (AAS) and inductively coupled plasma atomic emission spectrometry (ICP-AES) methods*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

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

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

4 Analytes and ranges

Analytes and ranges specified in this document shall be as follows.

a) Silicon (Si), range of 30 % to 70 % (mass fraction)

b) Nitrogen (N), range of 30 % to 45 % (mass fraction)

c) Aluminium (Al), range of 0,001 % to 0,6 % (mass fraction)

d) Iron (Fe), range of 0,001 % to 0,6 % (mass fraction)

e) Calcium (Ca), range of 0,001 % to 0,03 % (mass fraction)

f) Oxygen (O), range of 0,05 % to 5 % (mass fraction)

g) Carbon (C), range of 0,01 % to 6 % (mass fraction)

h) Fluorine (F), range of 0,001 % to 0,2 % (mass fraction)

i) Chlorine (Cl), range of 0,001 % to 0,2 % (mass fraction)

NOTE The results of an interlaboratory test conducted using three silicon nitride powder samples are listed in Annex B.

5 Preparation of test sample

5.1 General

The method of preparing samples shall be in accordance with ISO 8656-1 unless otherwise mutually agreed upon between the analyser and the customer.

5.2 Sampling

Sampling shall be in accordance with ISO 8656-1.

5.3 Drying

The following procedure shall be used: Take about 10 g of the sample into a flat-type weighing bottle (60 mm × 30 mm) and spread it uniformly over the bottom of the bottle. Place the bottle in a drying oven at 110 °C ± 5 °C for 2 h without a lid, and then cool in a desiccator (desiccant: magnesium perchlorate for drying) with a lid for 1 h.

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