

# Analysis of iron ores —

## Part 5: Methods for the determination of silicon content —

### Section 5.1 Gravimetric methods

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# Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Iron and Steel Standards Policy Committee (ISM/-) to Technical Committee ISM/58, upon which the following bodies were represented:

British Steel Industry  
Institution of Mining and Metallurgy  
Coopted members

The following body was also represented in the drafting of the standard, through subcommittees and panels:

British Ceramic Research Ltd.

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# National foreword

This Section of BS 7020 has been prepared under the direction of the Iron and Steel Standards Policy Committee and is identical with ISO 2598-1:1992 *Iron ores — Determination of silicon content — Part 1: Gravimetric methods* published by the International Organization for Standardization (ISO).

It supersedes BS 4158-3:1972, which is withdrawn.

**Cross-references**

| International standard | Corresponding British Standard                                                                                                                       |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| ISO 1042:1983          | BS 1792:1982 <i>Specification for one-mark volumetric flasks</i><br>(Identical)                                                                      |
| ISO 2596:1984          | BS 7020 <i>Analysis of iron ores</i><br>Part 2:1988 <i>Method for the determination of hygroscopic moisture in analytical samples</i><br>(Identical) |
| ISO 3081:1986          | BS 5660 <i>Methods of sampling iron ores</i><br>Part 1:1987 <i>Manual method of increment sampling</i><br>(Identical)                                |
| ISO 3082:1987          | Part 2:1987 <i>Mechanical method of increment sampling and sample preparation</i><br>(Identical)                                                     |
| ISO 3083:1986          | BS 5661:1987 <i>Method for preparation of samples of iron ores by manual means</i><br>(Identical)                                                    |
| ISO 7764:1985          | BS 7020 <i>Analysis of iron ores</i><br>Part 1:1988 <i>Method for the preparation of pre-dried test samples for chemical analysis</i><br>(Identical) |

The Technical Committee has reviewed the provisions of ISO 648, to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard. A related British Standard to ISO 648:1977 is BS 1583:1986 *Specification for one-mark pipettes*.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

**Summary of pages**

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

## 1 Scope

This part of ISO 2598 specifies two gravimetric methods for the determination of the silicon content of iron ores.

These methods are applicable, with certain limitations, to silicon contents between 1 % (m/m) and 15 % (m/m) in natural iron ores, iron ore concentrates and agglomerates, including sinter products.

Method 1 is not applicable to iron ores having a content of reducing agents greater than 2 % (m/m), for instance pyrite, or to ores having a fluorine content greater than 0,1 % (m/m). It is recommended for lower grade ores having a high content of amphoteric elements.

Method 2 can be used for ores having a fluorine content greater than 0,1 % (m/m). It is recommended for high grade ores having a low content of gangue.

NOTE 1 For ores having a silicon content less than 5 % (m/m), the method specified in ISO 2598-2:—<sup>1)</sup>, *Iron ores — Determination of silicon content — Part 2: Reduced molybdsilicate spectrophotometric method*, is preferable.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 2598. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 2598 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 648:1977, *Laboratory glassware — One-mark pipettes*.

ISO 1042:1983, *Laboratory glassware — One-mark volumetric flasks*.

ISO 2596:1984, *Iron ores — Determination of hygroscopic moisture in analytical samples — Gravimetric and Karl Fischer methods*.

ISO 3081:1986, *Iron ores — Increment sampling — Manual method*.

ISO 3082:1987, *Iron ores — Increment sampling and sample preparation — Mechanical method*.

ISO 3083:1986, *Iron ores — Preparation of samples — Manual method*.

ISO 7764:1985, *Iron ores — Preparation of predried test samples for chemical analysis*.

## 3 Principle

Decomposition of the test portion, by either method 1 or method 2.

Method 1: Decomposition by sintering with sodium peroxide, followed by treatment with hydrochloric and perchloric acids, or

Method 2: Decomposition by treatment with hydrochloric, nitric and perchloric acids (with inclusion of boric acid, if necessary) and evaporation to fumes of perchloric acid. Filtration of silica together with any residue, fusion with sodium carbonate and dissolution in hydrochloric and perchloric acids.

Evaporation of the solution from either method 1 or method 2 to fumes of perchloric acid and filtration of the precipitated silica. Ignition of the impure silica and weighing. Treatment of the ignited residue with hydrofluoric and sulfuric acids, followed by ignition and reweighing.

## 4 Reagents

During the analysis, use only reagents of recognized analytical grade and only distilled water or water of equivalent purity.

4.1 *Sodium peroxide* ( $\text{Na}_2\text{O}_2$ ), powder.

4.2 *Boric acid* ( $\text{H}_3\text{BO}_3$ ).

To be used as in note 7.

4.3 *Sodium carbonate* ( $\text{Na}_2\text{CO}_3$ ), anhydrous.

4.4 *Hydrochloric acid*,  $\rho$  1,16 g/ml to 1,19 g/ml.

4.5 *Hydrochloric acid*,  $\rho$  1,16 g/ml to 1,19 g/ml, diluted 1 + 1.

4.6 *Hydrochloric acid*,  $\rho$  1,16 g/ml to 1,19 g/ml, diluted 1 + 9.

4.7 *Perchloric acid*,  $\rho$  1,67 g/ml, 70 % (m/m), or  $\rho$  1,54 g/ml, 60 % (m/m).

4.8 *Sulfuric acid*,  $\rho$  1,84 g/ml, diluted 1 + 1.

4.9 *Sulfuric acid*,  $\rho$  1,84 g/ml, diluted 1 + 9.

4.10 *Hydrofluoric acid*,  $\rho$  1,13 g/ml, 40 % (m/m), or  $\rho$  1,185 g/ml, 48 % (m/m).

4.11 *Nitric acid*,  $\rho$  1,4 g/ml.

## 5 Apparatus

Ordinary laboratory apparatus, including one-mark pipettes and one-mark volumetric flasks complying with the specifications of ISO 648 or ISO 1042 respectively, and

5.1 *Nickel, zirconium or vitreous carbon crucibles*, of capacity approximately 40 ml.

5.2 *Platinum crucibles*, of capacity approximately 40 ml.

<sup>1)</sup> To be published. (At present published as ISO 4686:1980.)