***भारतीय मानक* IS 12308 (Part 10) : 2024**

***Indian Standard***

**ढलवाँ लोहा और कच्चा लोहा के रासायनिक विश्लेषण की पद्धतियाँ**

**भाग 10 आर्सेनाइट (आयतनी) पद्धति द्वारा मैंगनीज**

**(7.0 प्रतिशत तक) का निर्धारण**

 *( पहलापुनरीक्षण )*

**Methods for Chemical Analysis of Cast Iron and Pig Iron**

**Part 10 Determination of Manganese (Up to 7.0 Percent) by Arsenite (Volumetric) Method**

*( First Revision )*

ICS 77.080.10

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भारतीयमानकब्यूरो

BUREAU OF INDIAN STANDARDS

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Methods of Chemical Analysis of Metals Sectional Committee, MTD 34

FOREWORD

This Indian Standard (Part 10) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Methods of Chemical analysis of Metals Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1991. This revision has been brought out to bring the standard in the latest style and format of the Indian Standards.

This standard is published in different parts covering methods for chemical analysis of cast iron and pig iron are as listed below. This standard (Part 10) covers determination of manganese (up to 7.0 percent) by arsenite (volumetric) method.

The other parts in the series are:

|  |  |
| --- | --- |
| Part 1 | Determination of total carbon by thermal conductivity method |
|  Part 2 | Determination of sulphur by iodimetric titration method |
| Part 3 | Determination of manganese by periodate spectrophotometric method |
| Part 4 | Determination of total carbon, graphitic carbon and combined carbon by gravimetric method |
| Part 5 | Determination of phosphorus by slkalimetric method (for phosphorus 0.01 to 0.50 percent) |
| Part 6 | Determination of silicon (for silicon 0.1 to 6.0 percent) |
| Part 7 | Determination of nickel by dimethylglyoxime (gravimetric) method ( for nickel 0.5 to 36 percent ) |
| Part 8 | Determination of chromium by persulphate oxidation method (for chromium 0.1 to 28 percent) |
| Part 9 | Determination of molybdenum by thiocyanate (spectrophotometric) method (for molybdenum 0.1 to 1.0 percent ) |
| Part 11 | Determination of total carbon by the direct combustion volumetric method (for carbon 1.50 to 4.50 percent) |
| Part 12 | Determination of copper by atomic absorption spectrometric method (for copper 0.01 to 0.5 percent) |
| Part 13 | Determination of magnesium by atomic absorption spectrometric method (for magnesium upto 0.1 percent) |
| Part 14 | Determination of titanium by hydrogen peroxide (spectrophotometric) method (for titanium up to 0.25 percent) |

The composition of the Committee responsible for the formulation of this standard is given in Annex A

In reporting the result of a test or analysis made in accordance with this standard, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’.

*Indian Standard*

METHODS OF CHEMICAL ANALYSIS OF CAST IRON AND PIG IRON

PART 10 DETERMINATION OF MANGANESE (UP TO 7.0 PERCENT) BY ARSENITE (VOLUMETRIC) METHOD

*(First Revision)*

**1 SCOPE**

**1.1** This standard (Part 10) prescribes the method for determination of manganese (up to 7.0 percent) in plain cast iron and pig iron containing less than 0.5 percent of chromium and no cobalt content.

**1.2** This method is not applicable to alloy cast iron.

**2 SAMPLING**

The sample shall be drawn and prepared as prescribed in the relevant Indian Standard.

**3 QUALITY OF REAGENTS**

Unless specified otherwise, analytical grade reagents and distilled water shall be employed in the test.

**4 METHOD**

**4.1 Outline of the Method**

The sample is dissolved in acid mixture (phosphoric acid, sulphuric acid and nitric acid). Manganese is oxidised by ammonium persulphate in the presence of silver nitrate and titrated with standard sodium arsenite solution.

**4.2 Reagents**

**4.2.1** *Acid Mixture*

To 400 ml of water, cautiously, add 100 ml of sulphuric acid (rd= 1.84), 125 ml of phosphoric acid (rd= 1.75) and 250 ml of nitric acid (rd = 1.42). Cool, dilute to 1 litre and mix.

**4.2.2** *Silver Nitrate Solution* — 0.2 percent (*m/v*).

**4.2.3** *Sodium Chloride Solution* — 0.2 percent (*m/v*).

**4.2.4** *Ammonium Persulphate Solution* — 10percent (*m/v*), freshly prepared.

**4.2.5** *Standard Iron*— having same manganese content as the sample.

**4.2.6** *Sodium Arsenite* (NaAsO2) — solid.

**4.2.6.1** *Standard arsenite solution*

Dissolve 1.05 g of sodium arsenite in 2 litres of water containing 2 g of sodium bicarbonate. Standardise this solution (*see* **4.3**) with an iron sample of known manganese (**4.2.5**) content.

**4.3 Procedure**

**4.3.1** Transfer 0.100 g sample to a 250-ml conical flask. Add 30-ml of acid mixture. Heat gently to dissolve the sample and boil off nitrous fumes. Dilute to 50-m1 with water, filter through a medium tenured filter paper and wash 3 times to 4 times with hot water. To the filtrate, add 10 ml of silver nitrate solution, followed by 20 ml of ammonium persulphate solution. Boil for 20 s, remove from hot plate and cool rapidly to room temperature. Add 10 ml of sodium chloride solution and titrate immediately with standard sodium arsenite solution shaking vigorously until the pink colour is just discharged.

Take 0.100 g of a standard iron sample of a known manganese content and proceed as above. Both standard and sample are to be titrated under identical operative conditions.

NOTE — It is necessary to use standard iron sample having same manganese content as the sample under analysis.

**4.3.2** Run a blank using all the reagents, through the procedure specified in **4.3.1**.

**4.4** *Calculation*

 Manganese, percent by mass=$\frac{V\_{1} - V\_{2}}{V\_{3} - V\_{2}}$ × percentage of manganese in the standard

where

*V*1= volume, in ml, of sodium arsenite used for sample;

*V*2 = volume, in ml, of sodium arsenite used for blank; and

*V*3 = volume, in ml, of sodium arsenite used for standard.

**ANNEX A**

(*Foreword*)

**COMMITTEE COMPOSITION**

Methods of Chemical Analysis of Metals Sectional Committee, MTD 34

| *Organization* |  | *Representative(s)* |
| --- | --- | --- |
| CSIR - National Metallurgical Laboratory, Jamshedpur |  | Dr Sanchita Chakravarty **(*Chairperson*)** |
| Arcelor Mittal Nippon Steel, Mumbai |  | Shri Manoj Gupta |
|  Shri Kirit Tailor (*Alternate*) |
| Bhabha Atomic Research Centre, Mumbai |  | Ms Sanjukta A. Kumar |
|  | Shri M. V. Rana (*Alternate*) |
| CSIR - National Metallurgical Laboratory, Jamshedpur |  | Dr Ashok K. Mohanty (*Alternate*) |
| Defence Metallurgical Research Laboratory, Ministry of Defence, Hyderabad |  | Shri S. S. Kalyan Kamal |
| Directorate General of Quality Assurance, Ministry of Defence, New Delhi |  | Shri Kesavamoorthy M |
|  | Shri E Suman. Kumar (*Alternate*) |
| Geological Survey of India, New Delhi |  | Shri Nitin Purushottam |
|  |  Smt. Sanjukta Dey Pal (*Alternate*) |
| Hindalco Industries Limited, Mumbai |  | Shri Krishanu Mahapatra |
|  | Shri Ashutosh Acharya (*Alternate*) |
| Indian Metals and Ferro Alloys Limited, Bhubaneswar |  | Shri Dinesh Kumar Mohanty |
| JSW Steel Limited, Mumbai |  | Shri Kotrabasavaraju |
|  | Shri Marulasiddesha U. M. (*Alternate*) |
| Jawaharlal Nehru Aluminium Research Development and Design Centre, Nagpur |  |
|  | DrUpendra Singh |
| National Aluminium Company Limited, Bhubaneswar |  | Smt Sukla Nandi |
|  | Shri Debananda Bhattacharyya (*Alternate*) |
| National Mineral Development Corporation, Hyderabad |  | DrSaroj Kumar Sahu |
|  | Shri Ashish Shrivastava(*Alternate*) |
| National Test House, Kolkata |  | Dr Rajeev KumarUpadhyay |
|  | Shri Akbar H. (*Alternate*) |
| Research Designs and Standards Organization (RDSO), Lucknow |  | Shri Sandeep |
|  |  Smt Sunia (*Alternate*) |
| Shriram Institute for Industrial Research, Delhi |  | Shri Dr Laxmi Rawat |
|  | Shri Puneet Kapoor (*Alternate*) |
| Steel Authority of India Limited - Salem Steel Plant, Salem |  | Shri L. Sivakumar |
|  | Shri Vivekanandhan G. (*Alternate*) |
| TRL Krosaki Refractories Limited, Belpahar |  | Shri S. K. Subudhi |
| Tata Steel Limited, Kolkata |  | Shri Dr JatinMohapatra |
|  | DrRavikrishnaChatti(*Alternate*) |
| BIS Directorate General |  | Shri Sanjiv Maini, Scientist ‘F’/Senior Director and Head (Metallurgical Engineering) [Representing Director General (*Ex-officio*)] |

*Member Secretary*

Shri Ashish Prabhakar Wakle

Scientist ‘D’/Joint Director

(Metallurgical Engineering), BIS