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*Draft Indian Standard*

**METHODS OF CHEMICAL ANALYSIS OF MISCH METAL**

**PART 1 DETERMINATION OF CERIUM**

*[First Revision of IS 5425 (Part 1)]*

ICS 77.120.99

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Methods of Chemical Analysis of Metals  
Sectional Committee, MTD 34

Last date of comments  
**08 September 2023**

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**FOREWORD**

*(Formal foreword clause will be added later)*

This standard was first published in 1969. Misch metal is an alloy of rare earth metals and is used for improving strength, fluidity and other properties of cast iron, steel, aluminium, magnesium and nickel alloys to which it is added. This standard (Part 1) is one of the series. The other parts in the series are:

- Part 2      Determination of total rare earths
- Part 3      Determination of iron
- Part 4      Determination of aluminium
- Part 5      Determination of carbon

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

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'.

*Draft Indian Standard***METHODS OF CHEMICAL ANALYSIS OF MISCH METAL****PART 1 DETERMINATION OF CERIUM***( First Revision )***1 SCOPE**

This standard (Part 1) covers the method for the determination of cerium in various grades of misch metal as specified in IS 4182.

**2 REFERENCES**

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
IS 266 : 1993	Sulphuric acid — Specification ( <i>third revision</i> )
IS 1070 : 2023	Reagent grade water — Specification ( <i>fourth revision</i> )
IS 4182 : 1988	Specification for misch metal ( <i>first revision</i> )

**3 QUALITY OF REAGENTS**

Unless otherwise specified, pure chemicals and distilled water (*see* IS 1070) shall be employed in the tests.

NOTE — ‘Pure chemicals’ shall mean chemicals that do not contain impurities which affect the results of analysis.

**4 DETERMINATION OF CERIUM****4.1 Outline of Method**

Cerium is oxidized with potassium persulphate and the cerium (IV) thus obtained is titrated with standard ferrous sulphate solution using ferroin as indicator.

**4.2 Reagents**

**4.2.1** *Dilute Hydrochloric Acid* — 2.5 N.

**4.2.2** *Concentrated Sulphuric Acid* — specific gravity 1.84 (conforming to IS 266).

**4.2.3** *Potassium Persulphate* — solid.

**4.2.4** *Silver Nitrate Solution* — 0.25 percent (w/v).

#### 4.2.5 Standard Ferrous Sulphate Solution

Dissolve 9.8 g of ferrous ammonium sulphate  $[\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}]$  in 200 ml of water and add 5 ml of concentrated sulphuric acid. Make up the volume to 250 ml. Standardize against standard permanganate or ceric sulphate solution.

#### 4.2.6 Ferroin — M/40 solution.

### 4.3 Procedure

**4.3.1** Weigh accurately 2 g of the sample into a beaker. Add 50 ml of dilute hydrochloric acid to dissolve the sample. Make up the volume of the solution to 200 ml in a volumetric flask.

**4.3.2** Take 25.0 ml aliquot and add 5 ml of concentrated sulphuric acid. Evaporate to fumes. Cool and dilute to 200 ml. Add 1.5 g of potassium persulphate and 5 ml of silver nitrate solution. Boil for ten minutes and then allow to cool to room temperature.

**4.3.3** Titrate with standard ferrous sulphate solution till the yellow colour of ceric ion is barely perceptible. Then add one drop of indicator (ferroin) and complete the titration. At the end point, the solution changes sharply from a faint bluish green to red colour.

**4.3.4** Carry out a blank titration following the same procedure and using the same amounts of all reagents, but without the sample.

### 4.4 Calculation

$$\text{Cerium, percent} = \frac{(A - B) \times C \times 14.01}{D}$$

where

$A$  = volume in ml of standard ferrous sulphate solution required for the test solution,

$B$  = volume in ml of standard ferrous sulphate solution required for the blank,

$C$  = normality of standard ferrous sulphate solution, and

$D$  = mass in g of the sample represented by the aliquot taken.