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Ferric Oxide

DEFINITION

Ferric Oxide contains NLT 97.0% and NMT 100.5% of ferric oxide (Fe_2O_3), calculated on the ignited basis.

IDENTIFICATION

• **A. Identification Tests—General, *Iron* ⟨191⟩**

Sample solution: Dissolve 0.5 g in 50 mL of hydrochloric acid, and dilute with water to 200 mL.

Acceptance criteria: Meets the requirements of the test for *Ferric Salts*

ASSAY

• **Procedure**

To calculate the percentage of ferric oxide on the ignited basis, ignite about 2 g at 800 ± 25° to constant weight as directed in *Loss on Ignition* ⟨733⟩. [Note—Ignited Ferric Oxide is hygroscopic.]

Sample: 1.5 g

Blank: 25 mL of hydrochloric acid

Titrimetric system

Mode: Direct titration

Titrant: 0.1 N sodium thiosulfate VS

Endpoint detection: Visual

Analysis: Digest the *Sample* in 25 mL of hydrochloric acid on a water bath until dissolved. Add 10 mL of hydrogen peroxide TS, and evaporate on a water bath almost to dryness to volatilize all hydrogen peroxide. Dissolve the residue by warming with 5 mL of hydrochloric acid; add 25 mL of water; filter into a 250-mL volumetric flask, washing the filter with water; and add water to volume.

Transfer a 50-mL aliquot to a glass-stoppered flask, add 3 g of potassium iodide and 5 mL of hydrochloric acid, and insert the stopper into the flask. Allow the mixture to stand for 15 min, add 50 mL of water, and titrate the liberated iodine with *Titrant*, using starch TS as the indicator. Perform a blank determination in the same manner.

Calculate the percentage of ferric oxide (Fe_2O_3) in the portion of the sample taken:

$$\text{Result} = \{[(V_S - V_B) \times N \times F]/W\} \times 100$$

V_S = *Titrant* volume consumed by the *Sample* (mL)

V_B = *Titrant* volume consumed by the *Blank* (mL)

N = actual normality of the *Titrant* (mEq/mL)

F = equivalency factor, 79.85 mg/mEq

W = *Sample* weight, calculated with a correction for loss on ignition (mg)

Acceptance criteria: 97.0%–100.5% on the ignited basis

IMPURITIES

Change to read:

• ▲**Mercury ⟨261⟩, *Procedures, Procedure 2 and Procedure 3, Procedure 2*▲** (CN 1-Jun-2023)

Test preparation: Combine 0.67 g of Ferric Oxide and 35 mL of 0.5 N hydrochloric acid. Heat to boiling, and allow to cool.

Analysis: Proceed as directed for *Test preparation* in the chapter, beginning with “Add 2 drops of phenolphthalein”.

Acceptance criteria: NMT 3 µg/g

• **Limit of Arsenic**

Lead acetate cotton: Immerse absorbent cotton pledgets in a mixture of lead acetate TS and 2 N acetic acid (10:1). Free the cotton pledgets from excess liquid by expression, and allow to air-dry.

Sodium borohydride solution: 30 mg/mL of sodium borohydride in 0.25 N sodium hydroxide. Store in a loosely covered container protected from direct sunlight.

Mercuric bromide paper: Immerse several filter paper disks with a 15-mm diameter in alcoholic mercuric bromide TS, remove the disks from the solution, and allow to dry, protected from light. Store in a glass-stoppered container protected from light.

Arsenic trioxide stock solution: Dissolve 132.0 mg of arsenic trioxide in 2.0 mL of 2 N sodium hydroxide, and dilute with water to 100 mL.

Standard stock solution: On the day of use, dilute 1.0 mL of *Arsenic trioxide stock solution* with water to 1000 mL.

Standard solution: Dilute 1.5 mL of the *Standard stock solution* with hydrochloric acid to 10 mL. This solution contains 0.15 µg/mL of arsenic.

Sample solution: Dissolve 0.5 g of Ferric Oxide in several mL of hydrochloric acid with the aid of heat, and dilute with hydrochloric acid to 10.0 mL.

Apparatus: Prepare a 300-mL, side-arm conical flask containing a magnetic stirring bar. Attach to the conical flask a ground-glass stopper. Pass through the ground-glass stopper a glass tube 20 cm long with an internal diameter of 5 mm. The lower end of this tube is inside the conical flask, and it has been drawn to a tip with an internal diameter of 1 mm. There is an orifice, 2.5 mm in diameter, 15 mm from the tip, and at least 3 mm below the lower surface of the stopper. The upper end of the tube has a flat ground surface at a right angle to the axis of the tube.

A second glass tube, 30 mm long with an internal diameter of 5 mm and with a similar flat ground surface, is placed in contact with the ground surface of the first tube and is held in position by a clamp and springs.

Into the lower tube insert 55 mg of loosely packed *Lead acetate cotton*. Between the flat surfaces of the tubes place a disk of *Mercuric bromide paper*.

Analysis: Before placing the tube assembly into the flask, transfer the *Sample solution* to the flask, and add 5.0 mL of potassium iodide TS and 20 mL of water. Assemble the apparatus immediately, and stir while slowly adding, over a period of 20 min, 40 mL of *Sodium borohydride solution* through the side arm of the flask. Examine the stain produced on the *Mercuric bromide paper*. Perform the same *Analysis* using the *Standard solution*.

Acceptance criteria: NMT 3 µg/g; the stain produced on the *Mercuric bromide paper* from the *Sample solution* is not more intense than that from the *Standard solution*.

• **Limit of Lead**

Lead nitrate stock solution: 1.598 mg/mL of lead nitrate in 0.5 M nitric acid. Prepare and store this solution in glass containers free from soluble lead salts.

Standard stock solution: On the day of use, combine 5.0 mL of *Lead nitrate stock solution* and 10 mL of 1 N hydrochloric acid, and dilute with water to 100 mL.

Standard solution: Transfer 1.0 mL of the *Standard stock solution* to a 100-mL volumetric flask, add 10 mL of 1 N hydrochloric acid, and dilute with water to volume. This solution contains 0.5 µg/mL of lead.

Sample solution: Transfer 2.5 g of Ferric Oxide to a 100-mL, glass-stoppered conical flask. Add 35 mL of 0.1 N hydrochloric acid, and stir for 1 h. Filter, collecting the filtrate in a 50-mL volumetric flask, and dilute with 0.1 N hydrochloric acid to volume.

Instrumental conditions

(See *Atomic Absorption Spectroscopy ⟨852⟩*.)

Mode: Atomic absorption spectrophotometer equipped with a flow spoiler

Analytical wavelength: 217.0 nm (lead emission line)

Lamp: Lead hollow-cathode

Flame: Air–acetylene oxidizing

Analysis

Samples: *Standard solution* and *Sample solution*

Acceptance criteria: 0.001%; the absorbance of the *Sample solution* does not exceed that of the *Standard solution*.

SPECIFIC TESTS

• **Water-Soluble Substances**

Sample: 2.0 g

Analysis: Digest the *Sample* in 100 mL of water on a boiling water bath for 2 h, filter, and wash the filter with water. Evaporate the filtrate and washings, and dry the residue at 105° for 1 h.

Acceptance criteria: 1.0%; NMT 20 mg of residue

• **Acid-Insoluble Substances**

Sample: 2.0 g

Analysis: Digest the *Sample* in 25 mL of hydrochloric acid by boiling for 20 min. Add 100 mL of hot water, and filter quantitatively through a tared filtering crucible, with the aid of hot wash water, until the filtrate tests negative for chloride. Dry the crucible and contents at 105° for 1 h.

Acceptance criteria: 0.3%; the residue weighs NMT 6 mg.

• **Organic Colors and Lakes**

Sample: 3.0 g

Analysis: Place 1.0 g of the *Sample* in each of 3 beakers, and add 25 mL of each of the following reagents, one reagent to each beaker: 1-chloronaphthalene, alcohol, and chloroform. Heat the beakers containing alcohol and chloroform just to boiling. Heat the other beaker on a boiling water bath for 15 min, with occasional swirling. Pass the contents of the beakers through retentive, solvent-resistant filter paper. If any of the filtrates shows visible turbidity, centrifuge for 15 min. Record the spectra against respective solvent blanks in 1-cm cells from 350 to 750 nm.

Acceptance criteria: No peak above the noise level with a slope greater than +0.001 absorbance unit/nm is found.

ADDITIONAL REQUIREMENTS

• **Packaging and Storage:** Preserve in well-closed containers.

Auxiliary Information - Please check for your question in the FAQs before contacting USP.

Topic/Question	Contact	Expert Committee
FERRIC OXIDE	Documentary Standards Support	SE2020 Simple Excipients

Chromatographic Database Information: Chromatographic Database

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