INTERNATIONAL STANDARD 793

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Aluminium and aluminium alloys — Determination of iron — Orthophenanthroline photometric method

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, International Standard ISO 793 replaces ISO Recommendation R 793-1968 drawn up by Technical Committee ISO/TC 79, *Light materials and their alloys*.

The Member Bodies of the following countries approved the Recommendation :

Argentina	Germany	South Africa, Rep. of
Austria	Hungary	Spain
Belgium	Korea, Rep. of	Sweden
Brazil	India	Switzerland
Bulgaria	Israel	Turkey
Canada	Italy	United Kingdom
Chile	Japan	U.S.A.
Czechoslovakia	Netherlands	U.S.S.R.
Egypt. Arab Rep. of	Norway	Yugoslavia
France	Poland	

The Member Body of the following country expressed disapproval of the Recommendation on technical grounds :

Ireland

Printed in Switzerland

Aluminium and aluminium alloys — Determination of iron — Orthophenanthroline photometric method

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a photometric method for the determination of iron in aluminium and aluminium alloys.

The method is applicable to the determination of iron content between 0,05 and 2,50 %.

The method does not apply completely to the following special cases for which it should be modified as described in Annex A or Annex B :

a) unalloyed aluminium, aluminium-silicon alloys and any other aluminium alloy that is not easily attacked with hydrochloric acid (see Annex A);

b) alloys containing copper (copper content over 5 %), zinc (zinc content over 4 %), nickel (nickel content over 2 %), or alloys with a proportional combination of these elements more than 5 % total (see Annex B).

2 PRINCIPLE

Attack with hydrochloric acid. Reduction of iron(III) to iron(II) by hydroxylammonium chloride.

Formation in buffered solution between pH 3,5 and pH 4,5 of the orange-red coloured complex, bivalent iron-orthophenanthroline.

Photometric measurement at a wavelength of about 510 nm.[1)]

3 REAGENTS

During the analysis use only distilled water or water of equivalent purity.

3.1 Hydrochloric acid, ρ 1,1 g/ml, approximately 6 N solution.

Take 500 ml of hydrochloric acid (ρ 1,19 g/ml), approximately 12 N, and make up the volume to 1 000 ml with water.

3.2 Hydrochloric acid, ρ 1,16 g/ml, approximately 10 N solution.

Dilute 820 ml of hydrochloric acid (ρ 1,19 g/ml) with water and, after cooling to 20 °C, make up the volume to 1 000 ml. Check the relative density and, if necessary, adjust the strength of the solution.

3.3 Sodium hydroxide, 5 N solution.

Dissolve 200 g of sodium hydroxide (NaOH) in a nickel basin with about 400 ml of water. After cooling, transfer the solution to a 1 000 ml volumetric flask, rinsing the basin, and make up the volume to 1 000 ml. (Store in polythene containers.)

3.4 Mixed reagent

Mix the following solutions in the ratio 1 : 1 : 3 by volume :

3.4.1 Hydroxylammonium chloride solution

Dissolve 10 g of hydroxylammonium chloride ($NH_2OH.HCl$) in a little water and make up the volume to 1 000 ml.

3.4.2 Orthophenanthroline solution

Dissolve 2,5 g of orthophenanthroline monohydrate ($C_{12}H_8N_2.H_2O$), or 3 g of orthophenanthroline hydrochloride monohydrate ($C_{12}H_8N_2.HCl.H_2O$), in water, warm slightly in order to complete solution, cool and make up the volume to 1 000 ml.

3.4.3 Buffer solution

Dissolve 272 g of sodium acetate ($CH_3COONa.3H_2O$) in about 500 ml of water, filter, add 240 ml of glacial acetic acid (CH_3COOH), (ρ 1,05 g/ml), approximately 17,4 N, then make up the volume to 1 000 ml with water.

The mixed reagent should be stored in a dark coloured glass container; it should not be used after storage for more than 4 weeks.

1) Copper, which may interfere if present in appreciable amounts, is largely eliminated in the attack. Of the elements normally present in aluminium and its alloys, some do not interfere, while others form colourless soluble complexes with orthophenanthroline, which do not absorb at the wavelength at which the photometric measurement is performed.