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Fireworks — Test methods for determination of specific chemical substances —

Part 13: Qualitative detection of elemental metals in firework compositions

Artifices de divertissement — Méthodes d'essai pour la détermination de substances chimiques spécifiques —

Partie 13: Détection qualitative des métaux élémentaires dans les compositions pyrotechniques d'artifices

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 264, *Fireworks*.

A list of all the parts in the ISO 22863 series can be found on the ISO website.

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Fireworks — Test methods for determination of specific chemical substances —

Part 13: Qualitative detection of elemental metals in firework compositions

1 Scope

This document specifies a method for the qualitative detection of reactive elemental metals (e.g. Mg, Al, Be, Mn, Zn, Fe, Co, Ni, Sn) used in compositions of fireworks.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 22863-1, *Fireworks — Test methods for determination of specific chemical substances — Part 1: General*

ISO 22863-16, *Fireworks—Test methods for determination of specific chemical substances— Part 16: Procedure for identification of report or burst charges*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22863-1 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Principle of the method

Based on the property of the reactive metal to be oxidized with production of hydrogen under a certain pH value, the sample is reacted with a hydrochloric acid solution, nitric acid, hydrofluoric acid or sodium hydroxide solution in a closed vessel, and the presence of the reactive metal is determined by detecting the hydrogen that is generated.

5 Reagents

Except as otherwise specified, reagents of high purity shall be used. Water shall be demineralized by reverse osmosis process ("deionized water").

5.1 Ethanol (AR)

5.2 Ethanol solution (50 %, v/v)**:**1 part ethanol (5.1)+ 1 part deionized water.

5.3 Hydrochloric acid (AR, ρ = 1,19 g/ml).

5.4 Diluted hydrochloric acid (1 part hydrochloric acid (5.3)+ 1 part deionized water).

5.5 Hydrofluoric acid (AR, 40 % v/v, to be kept in a plastic bottle).

WARNING — Specific personal protective equipment shall be worn when operating with hydrofluoric acid.

5.6 Sodium hydroxide (AR).

5.7 Diluted sodium hydroxide, weight 20 g Sodium hydroxide (5.6) and dissolve it in 100 ml of deionized water.

5.8 Nitric acid (AR, 65 % to 70 % v/v).

5.9 Mixed hydrochloric acid and nitric acid (3 parts hydrochloric acid (5.3) + 1 part nitric acid (5.8), v/v). This mixture shall be prepared less than 30 min before use.

6 Apparatus

6.1 Surface dish, Ø100 mm.

6.2 Hydrogen detector, 0 ppm to 1 000 ppm, resolution ≤ 10 ppm, accuracy ≤ 3 %.

6.3 Analytical Balance, accuracy 0,01 g.

6.4 Gas generator with glass Erlenmeyer flask, 200 ml (see Figure 1).

6.5 Gas generator with PTFE Erlenmeyer flask, 200 ml (see Figure 1).