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Petroleum products — Determination of sulfur content of automotive fuels — Ultraviolet fluorescence method

Produits pétroliers — Détermination de la teneur en soufre des carburants pour automobiles — Méthode par fluorescence ultraviolette

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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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 documents 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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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 28, *Petroleum and related products, fuels and lubricants from natural or synthetic sources*.

This third edition cancels and replaces the second edition (ISO 20846:2011), which has been technically revised. The main change compared to the previous edition is the extension of the Scope to include hydrotreated vegetable oil (HVO) and the synthetic fuel “gas to liquid” (GTL).

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Petroleum products — Determination of sulfur content of automotive fuels — Ultraviolet fluorescence method

WARNING — The use of this document can involve hazardous materials, operations and equipment. This document does not purport to address all of the safety problems associated with its use. It is the responsibility of users of this document to take appropriate measures to ensure the safety and health of personnel prior to application of the document and fulfil other applicable requirements for this purpose.

1 Scope

This document specifies an ultraviolet (UV) fluorescence test method for the determination of the sulfur content of the following products:

— having sulfur contents in the range 3 mg/kg to 500 mg/kg,

  — motor gasolines containing up to 3,7 % (*m*/*m*) oxygen [including those blended with ethanol up to about 10 % (*V*/*V*)],

  — diesel fuels, including those containing up to about 30 % (*V*/*V*) fatty acid methyl ester (FAME),

— having sulfur contents in the range of 3 mg/kg to 45 mg/kg,

  — synthetic fuels, such as hydrotreated vegetable oil (HVO) and gas to liquid (GTL).

Other products can be analysed and other sulfur contents can be determined according to this test method, however, no precision data for products other than automotive fuels and for results outside the specified range have been established for this document. Halogens interfere with this detection technique at concentrations above approximately 3 500 mg/kg.

NOTE 1 Some process catalysts used in petroleum and chemical refining can be poisoned when trace amounts of sulfur-bearing materials are contained in the feedstocks.

NOTE 2 This test method can be used to determine sulfur in process feeds and can also be used to control sulfur in effluents.

NOTE 3 For the purposes of this document, "% (*m*/*m*)" and "% (*V*/*V*)" are used to represent the mass fraction, *w*, and the volume fraction, *φ*, of a material respectively.

NOTE 4 Sulfate species in ethanol do not have the same conversion factor of organic sulfur in ethanol. Nevertheless, sulfates have a conversion factor close to that of organic sulfur.

NOTE 5 Nitrogen interference can occur, see 6.5 for further guidance.

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 1042, *Laboratory glassware — One-mark volumetric flasks*

ISO 3170, *Petroleum liquids — Manual sampling*

ISO 3171, *Petroleum liquids — Automatic pipeline sampling*

ISO 3675, *Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method*

ISO 12185, *Crude petroleum and petroleum products — Determination of density — Oscillating U-tube method*

3 Terms and definitions

No terms and definitions are listed in this document.

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

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

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

4 Principle

A hydrocarbon sample is either directly injected or placed in a sample boat. Then, it enters a high temperature combustion tube (1 000 °C to 1 100 °C), where the sulfur is oxidized to sulfur dioxide (SO_2) in an oxygen-rich atmosphere. Water produced during the sample combustion is removed and the sample combustion gases are exposed to UV light. The SO_2 absorbs the energy from the UV light and is converted to excited sulfur dioxide (SO_2*). The fluorescence emitted from the excited SO_2* as it returns to a stable state SO_2 is detected by a photomultiplier tube and the resulting signal is a measure of the sulfur contained in the sample.

5 Reagents and materials

5.1 Inert gas, argon or helium, high purity grade with a minimum purity of 99,998 % (*V*/*V*).

5.2 Oxygen, high purity grade with a minimum purity of 99,75 % (*V*/*V*).

CAUTION — Oxygen vigorously accelerates combustion.

5.3 Solvent.

5.3.1 General

Use either that specified in 5.3.2 or 5.3.3, or a solvent similar to that occurring in the sample under analysis. Correction for sulfur contribution from solvents used in standard preparation and sample dilution is required. Alternatively, use of a solvent with non-detectable sulfur contamination relative to the unknown sample makes the blank correction unnecessary.

5.3.2 Toluene, reagent grade.

5.3.3 Isooctane, reagent grade.

CAUTION — Flammable solvents.