International Standard

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

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

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Contents

Page

Foreword ..... **iv**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **2**

4 Principle **2**

5 Reagents and materials **2**
5.1 Inert gas 2
5.2 Oxygen 2
5.3 Solvent 2
5.4 Sulfur compounds 2
5.5 Sulfur stock solution 3
5.6 Calibration standards 3
5.7 Quality control samples 3
5.8 Quartz wool 4

6 Apparatus **4**

7 Sampling and sample handling **5**

8 Apparatus preparation **5**

9 Apparatus calibration and verification **6**
9.1 Multi-point calibration 6
9.2 Single point calibration 8
9.3 Verification 8

10 Procedure **9**

11 Calculation **9**
11.1 Using multi-point calibration 9
11.2 Using one-point calibration 10
11.3 Calculation 10

12 Expression of results **11**

13 Precision **11**
13.1 General 11
13.2 Repeatability, *r* 11
13.3 Reproducibility, *R* 11
13.4 Precision estimates 12

14 Test report **12**

Bibliography **13**

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Foreword

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This document was prepared by Technical Committee ISO/TC 28, *Petroleum and related products, fuels and lubricants from natural or synthetic sources*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 19, *Gaseous and liquid fuels, lubricants and related products of petroleum, synthetic and biological origin,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fourth edition cancels and replaces the third edition (ISO 20846:2019), which has been technically revised.

The main changes are as follows:

— the extension of the application scope to include higher blends of biodiesel (FAME) from 50 % up to neat FAME (B100);

— further instructions regarding the (validity of the) multi-point calibration have been implemented.

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.

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Petroleum and related 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 a mass fraction of 3,7 % (3,7 % (*m/m*)) of oxygen [including those blended with a volume fraction of ethanol up to about 10 % (10 % (*V/V*))];

  — diesel fuels, including those containing up to a volume fraction of about 50 % of 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);

— having sulfur contents in the range of 3 mg/kg to 30 mg/kg:

  — neat FAME (B100) and diesel fuels containing volume fraction of more than 50 % of FAME.

Other products (for example process feeds and effluents) 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.

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, *Hydrocarbon 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, petroleum products and related products — Determination of density — Laboratory density meter with an oscillating U-tube sensor*

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3 Terms and definitions

No terms and definitions are listed in this document.

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

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

Use argon or helium, high purity grade with a minimum purity of 99,998 % by volume.

5.2 Oxygen

Use high purity grade with a minimum purity of 99,75 % by volume.

WARNING — Oxygen vigorously accelerates combustion.

5.3 Solvent

Use either that specified in a) or b), 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, a solvent with non-detectable sulfur contamination relative to the unknown sample can be used, making the blank correction unnecessary.

NOTE Non-detectable is in general considered to be below 0,5 mg/kg for regular samples, though solvents with < 0,05 mg/kg of sulfur are readily available.

a) Toluene, reagent grade.

b) Isooctane, reagent grade.

WARNING — Flammable solvents.

5.4 Sulfur compounds

Compounds with a minimum purity of 99 % by mass shall be used. Examples are given in a) to d). Where the purity of these compounds is less than 99 % by mass, the concentrations and nature of all impurities shall be established.

NOTE 1 A correction for chemical impurity can be applied when the sulfur content is known with accuracy.

NOTE 2 Certified reference materials (CRM) produced in accordance with ISO 17034[3] are suitable alternatives to the compounds listed in a) to d).

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