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Petroleum and related products — Determination of arsenic in crude petroleum using atomic fluorescence spectrometry

Pétrole et produits connexes — Détermination de l'arsenic dans le pétrole brut par spectrométrie de fluorescence atomique

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

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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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.*

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Introduction

Arsenic compounds have a wide range of contents in crude oil. During the refining process, it is easy for the arsenic compounds to be adsorbed by the catalyst, leading to catalyst poisoning. It has been confirmed that arsenic compounds in crude oil at a concentration level of 10^{-3} mg/kg can cause permanent poisoning and deactivation of platinum-based catalysts for reforming. The presence of arsenic compounds can directly lead to contamination of straight run fractions of oil products such as naphtha or heavy fraction oil.

The determination of arsenic content plays an important role in guiding the removal of arsenic, determining the arsenic tolerance of catalysts, and extending the service life of catalysts.

This document provides a method to determine the arsenic content in crude oil. Since arsenic occurs naturally in organic and inorganic compounds, a closed state is maintained during the digestion process in order to fully decompose all arsenic containing compounds and avoid losses.

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Petroleum and related products — Determination of arsenic in crude petroleum using atomic fluorescence spectrometry

WARNING — It is absolutely essential that tests conducted according to this document be carried out by suitably trained staff. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

1 Scope

This document specifies a method for the determination of arsenic content in crude oil pretreated by a closed microwave digestion method by atomic fluorescence spectrometry.

The precision statement of this test method was determined in an interlaboratory study and is valid for samples with an arsenic content between 0,35 mg/kg and 3,57 mg/kg. The test method can also be applied to samples with either a higher or lower arsenic content, however, no precision data has been determined at levels outside of this range.

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 3696, *Water for analytical laboratory use — Specification and test methods*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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

After adding acid to the sample and pre-treating it by a closed microwave digestion method, adding thiourea-ascorbic acid mixed solution to reduce the arsenic (V) to arsenic (III) in the solution, add sodium tetrahydroborate solution under acidic conditions to convert the arsenic into gaseous arsenic hydrogen. At the same time, when the hydrogen generated by the reaction of sodium borohydride and acid is brought into the atomizer by argon, the hydrogen is ignited and forms an argon hydrogen flame, and arsine leads into the atomizer by means of argon gas flow. The arsenic content in the sample is quantitatively measured by atomic fluorescence spectrometry.

5 Reagents

It is important to use high purity reagents in all cases. Use only reagents of recognized analytical grade, unless otherwise specified.

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