INTERNATIONAL STANDARD

ISO 3987

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Petroleum products — Lubricating oils and additives — Determination of sulfated ash

Produits pétroliers — Huiles lubrifiantes et additifs — Détermination des cendres sulfatées

Reference number
ISO 3987:1994(E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 3987 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants.*

This second edition cancels and replaces the first edition (ISO 3987:1980), which has been technically revised.

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Petroleum products — Lubricating oils and additives — Determination of sulfated ash

WARNING — The use of this International Standard may involve hazardous materials, operations and equipment. The standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This International Standard describes a procedure for the determination of the mass percentage of sulfated ash from unused lubricating oils containing additives and from additive concentrates used in compounding. These additives usually contain one or more of the following metals: barium, calcium, magnesium, zinc, potassium, sodium and tin. The elements sulfur, phosphorus and chlorine can also be present in combined form.

Application of this procedure to sulfated ash levels below 0,02 % *(m/m)* is restricted to oils containing ashless additives. The lower limit of applicability of the procedure is 0,005 % *(m/m)* sulfated ash.

This International Standard is not intended for the analysis of used engine oils containing lead, nor is it recommended for the analysis of non-additive lubricating oils, for which ISO 6245:1993, *Petroleum products — Determination of ash,* is suitable.

NOTE 1 There is evidence that magnesium does not react in the same manner as alkali metals in this procedure. If magnesium additives are present, the data should be interpreted with caution.

NOTE 2 There is evidence that samples containing molybdenum can give low results, since molybdenum compounds are not fully recovered at the temperature of ashing.

The sulfated ash may be used to indicate the concentration of known metal-containing additives in new lubricating oils. When phosphorus is absent, barium, calcium, magnesium, sodium and potassium are converted to their sulfates and tin(IV) and zinc to their oxides (see note 3). Sulfur and chlorine do not interfere, but when phosphorus is present with metals, it remains partially or wholly in the sulfated ash as metal phosphates.

NOTE 3 Since zinc sulfate slowly decomposes to its oxide at the ignition temperature specified in the procedure, samples containing zinc may give variable results unless the zinc sulfate is completely converted to the oxide.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3170:1988, *Petroleum liquids — Manual sampling.*

ISO 3171:1988, *Petroleum liquids — Automatic pipeline sampling.*

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods.*

3 Definition

For the purposes of this International Standard, the following definition applies.

3.1 sulfated ash: Residue remaining after the lubricating oil sample has been carbonized, and the residue subsequently treated with sulfuric acid and heated to constant mass.