

# INTERNATIONAL STANDARD



# 157

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## Hard coal — Determination of forms of sulphur

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## FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 27 has reviewed ISO Recommendation R 157 and found it technically suitable for transformation. International Standard ISO 157 therefore replaces ISO Recommendation R 157-1960 to which it is technically identical.

ISO Recommendation R 157 was approved by the Member Bodies of the following countries :

Austria	Ireland	South Africa, Rep. of
Belgium	Italy	Spain
Canada	Japan	Sweden
Czechoslovakia	Mexico	Switzerland
Denmark	Netherlands	United Kingdom
Germany	New Zealand	U.S.A.
Greece	Poland	Yugoslavia
Hungary	Portugal	
India	Romania	

The Member Body of the following country expressed disapproval of the Recommendation on technical grounds :

France

No Member Body disapproved the transformation of ISO/R 157 into an International Standard.

# Hard coal — Determination of forms of sulphur

## 1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies methods of determining the sulphate sulphur and pyritic sulphur contents of hard coal and of calculating the amount of organic sulphur present.

## 2 PRINCIPLE

### 2.1 General

The principle to be applied for the determination of sulphur in coal depends on the form in which the sulphur is combined in the coal.

Sulphur is usually combined in coal in three ways, as

- inorganic sulphates,
- iron pyrites ( $\text{FeS}_2$ ), and
- organic sulphur compounds.

The amounts of sulphur so combined are known respectively as

- sulphate sulphur,
- pyritic sulphur,
- organic sulphur.

### 2.2 Sulphate sulphur

Sulphate sulphur is determined by extracting coal with dilute hydrochloric acid and determining the sulphur in the extract,

- either gravimetrically, see clause 4;
- or titrimetrically, see clause 5.

### 2.3 Pyritic sulphur

Pyritic sulphur is insoluble in dilute hydrochloric acid, but it is quantitatively dissolved by dilute nitric acid under the experimental conditions described.

It is conveniently determined by an indirect method, that is by determining the amount of iron combined in the pyritic state and calculating the amount of sulphur associated with this iron, see clause 6.

Alternatively, the coal is finely crushed to release the particles of pyrites, the sulphur in which is reduced to hydrogen sulphide by reaction with nascent hydrogen and is absorbed in cadmium acetate and determined iodometrically, see clause 7.

### 2.4 Organic sulphur

Organic sulphur is calculated by deducting the sum of percentages of "sulphate" and "pyritic" sulphur from the total sulphur in the coal, see clause 8.

### 2.5 Calculation to other bases

The results of these determinations are reported on the "air-dried" basis; calculation of the results to other bases is dealt with in ISO/R 1170.

## 3 PREPARATION OF SAMPLE

The coal used for the determination of sulphate sulphur and pyritic sulphur is the analysis sample ground to pass a sieve of 0,2 mm aperture. If necessary expose the sample in a thin layer for the minimum time required for the moisture content to reach approximate equilibrium with the laboratory atmosphere.

Before commencing the determination, mix the air-dried sample of coal thoroughly for at least 1 min, preferably by mechanical means.

## 4 SULPHATE SULPHUR — GRAVIMETRIC METHOD

### 4.1 Reagents

All reagents shall be of analytical reagent quality and distilled water shall be used throughout.

#### 4.1.1 Hydrochloric acid, $\rho$ 1,18 g/ml.

#### 4.1.2 Hydrochloric acid.

Dilute 420 ml of the hydrochloric acid (4.1.1) to 1 l with water.

#### 4.1.3 Hydrochloric acid.

Dilute 42 ml of the hydrochloric acid (4.1.1) to 1 l with water.

#### 4.1.4 Barium chloride, 85 g/l solution

Dissolve 100 g of barium chloride dihydrate in water and dilute to 1 l. Filter before use through a close-textured, doubly acid-washed filter paper or filter paper pad.