Australian Standard™

Coal and coke—Analysis and testing

Part 11: Coal—Forms of sulfur

Standards Australia

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Australian Coal Association

Australian Coal Preparation Society

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PREFACE

This Standard was prepared by the Standards Australia Committee MN-001, Coal and Coke, to supersede AS 1038.11—1993, *Coal and coke—Analysis and testing* Part 11: *Coal—Forms of sulfur*.

This Standard confirms the methods for the determination of the different forms of sulfur and has been editorially updated to be consistent with the other parts of the AS 1038 series.

The term ‘informative’ has been used in this Standard to define the application of the appendix to which is applies. An ‘informative’ appendix is only for information and guidance.

CONTENTS

FOREWORD

Sulfur in coal is present in organic combination as part of the coal substance, as pyrite or less frequently marcasite, and as sulfates. The pyritic and marcasite forms of sulfur have the same chemical composition (FeS_2) but have different crystalline forms, pyrite being isometric and marcasite orthorhombic. In this Standard no distinction is made between sulfur present in pyrite and marcasite.

Non-pyritic sulfide sulfur occurs in some coals, predominantly as sphalerite (zinc sulfide). In Australian coals, the concentration of sphalerite is generally less than 0.1%. The occurrence of a significant concentration of non-pyritic sulfide sulfur can be determined by the detection of the objectionable odour of hydrogen sulfide gas on addition of hydrochloric acid to the coal.

Sulfate sulfur is present in coal primarily as either gypsum or iron sulfate. The former is present in fresh coal and the latter results with weathering of coal, although iron sulfates may be present in fresh coal in small amounts. Sulfate sulfur can be extracted from the coal by treatment with hydrochloric acid.

In the determination of pyritic sulfur, the coal is first extracted with hydrochloric acid to remove sulfate and non-pyritic sulfide sulfur, and non-pyritic iron. The residue is then extracted with nitric acid to decompose the pyritic sulfur, which is determined indirectly by measuring the pyritic iron concentration.

Organic sulfur is chemically linked to the coal structure and generally cannot be removed by physical methods. Organic sulfur is determined by difference after subtracting pyritic and sulfate sulfur from the total sulfur.

STANDARDS AUSTRALIA

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SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out methods for the determination of sulfate sulfur, pyritic sulfur and organic sulfur in coal.

The methods are as follows:

(a) Sulfate sulfur is determined directly as a sulfate in a hydrochloric acid extract of the sample.

(b) Pyritic sulfur is calculated from the determination of iron soluble in nitric acid following removal of non-pyritic iron by hydrochloric acid.

(c) Organic sulfur is obtained by subtracting the sum of the pyritic sulfur and sulfate sulfur from the total sulfur, determined by one of the methods given in AS 1038.6.3.

1.2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS
1038 Coal and coke—Analysis and testing
1038.3 Part 3: Proximate analysis of higher rank coal
1038.6.3 Part 6.3: Ultimate analysis of higher rank coal—Total sulfur (series)
1038.16 Part 16: Assessment and reporting of results

2134 Recommended practice for chemical analysis by atomic absorption spectrometry
2134.1 Part 1: Flame atomic absorption spectrometry

2243 Safety in laboratories (series)

2418 Coal and coke—Glossary of terms

2508 Safe storage and handling information card

4264 Coal and coke—Sampling
4264.1 Part 1: Higher rank coal—Sampling procedures

2706 Numerical values—Rounding and interpretation of limiting values

3753 Recommended practice for chemical analysis by ultraviolet/visible spectrophotometry

ISO
157 Coal—Determination of forms of sulfur

1.3 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 2418 apply.