Australian Standard™

Methods for the analysis and testing of lower rank coal and its chars

Part 6: Lower rank coal—Ultimate analysis—Classical methods

Standards Australia

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The following are represented on Committee MN-001:

Australasian Institute of Mining and Metallurgy

Australian Coal Association

Australian Coal Preparation Society

Australian Institute of Energy

CSIRO, Energy Technology

Coalfield Geology Council of New South Wales

Department of Mines and Energy, Queensland

Electricity Supply Association of Australia

Institution of Engineers, Australia

Minerals Council of Australia

University of Newcastle

University of New South Wales

University of Queensland

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PREFACE

This Standard was prepared by Standards Australia Committee MN-001, Coal and Coke, to supersede AS 2434.6.1—1986, *Methods for the analysis and testing of lower rank coal and its chars*, Part 6.1: *Ultimate analysis of lower rank coal—Classical methods*.

This Standard is based on AS 1038.6.1, *Coal and coke—Analysis and testing*, Part 6.1: *Higher rank coal and coke—Ultimate analysis—Carbon and hydrogen* and AS 1038.6.2, *Coal and coke—Analysis and testing*, Part 6.2: *Higher rank coal and coke—Ultimate analysis—Nitrogen*, and has been specifically modified to meet the analytical requirements of lower rank Australian coals.

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FOREWORD

As a general rule, Standards suitable for lower rank coals can also be applied to higher rank coals, but the reverse does not apply. Some features specific to lower rank coal methods are as follows:

(a) *Sample mass* Because of the greater heterogeneity of lower rank coals, relatively large sample masses are essential for successful analyses, and semi-micro methods are not applicable.

(b) *Sample condition* Many lower rank coals are powerful desiccants and adsorb water even in desiccators. Preparation of lower rank coal samples for analysis should involve either air equilibration followed by a moisture determination concurrent with the analysis, or complete drying and encapsulation of the sample.

(c) *Carbon and hydrogen* The Liebig principle is preferred for the determination of carbon and hydrogen in lower rank coals, because some high volatile coals can explode under the heating conditions of the high temperature method.

The ultimate analysis of coal comprises the determination of the elements carbon, hydrogen, nitrogen, sulphur and oxygen. This Standard describes the determination of the total amounts of the first four elements, regardless of their mode of occurrence; oxygen is estimated by difference, because simple direct methods of sufficient accuracy are not available. Hydrogen includes that present both in the moisture and in the water of hydration of constituents of the mineral matter. All nitrogen is assumed to be present in the coal substance. Sulphur is normally present in three forms: as pyrite (FeS_2) and other sulfides, as inorganic sulphates associated with the mineral matter, and as organic sulphur compounds in the coal substance.

The data obtained from use of this Standard will not lead to a useful estimate of the percentage of oxygen in lower rank coal. An accurate estimate of the oxygen content can only be obtained by expressing the carbon, hydrogen, nitrogen and sulphur contents on a dry, mineral and inorganic free (dmif) basis. This in turn requires a separate determination of coal minerals and inorganic matter. The dmif expression of results for lower rank coals is discussed in AS 1038.16, *Coal and coke—Analysis and testing*, Part 16: *Assessment and reporting of results*.

Where the temperature for a particular operation is specified as a definite figure, it is to be understood that this figure should be attained as closely as possible and that it should be subject only to the errors inherent in accurate measurement.

Where a temperature range is given, the temperature may be anywhere in the range without detriment to the result. However, the mean of the range should be targeted so the inherent errors in measurement do not cause a temperature outside the specified range to be used inadvertently.

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* KISS, L.T., and KING, T.N. *Fuel*, 1977, *56*, 340; ibid, 1979, *58*, 437.

STANDARDS AUSTRALIA

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1 SCOPE

This Standard sets out the method for the determination of the ultimate analysis of lower rank coals and char in terms of their carbon, hydrogen, nitrogen and sulphur contents.

2 REFERENCED DOCUMENTS

The following Standards are referred to in this Standard:

AS
1038 Coal and coke—Analysis and testing
1038.3 Part 3: Proximate analysis of higher rank coal
1038.8.2 Part 8.2: Coal and coke—Chlorine—High-temperature combustion method
1038.16 Part 16: Assessment and reporting of results
1038.23 Part 23: Higher rank coal—Carbonate carbon
1152 Specification for test sieves
2165 Laboratory glassware—Burettes
2243 Safety in laboratories (series)
2167 Graduated straight pipettes
2418 Coal and coke—Glossary of terms
2434 Methods for the analysis and testing of lower rank coal and its chars
2434.7 Part 7: Lower rank coal—Determination of moisture in the analysis sample
2508 Safe storage and handling information card (series)
4264 Coal and coke—Sampling
4264.3 Part 3: Lower rank coal—Sampling procedures

ISO
1994 Hard coal—Determination of oxygen content

BS
1752 Laboratory sintered or fritted filters including porosity grading

3 DEFINITIONS

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

4 SAFETY

For information on laboratory safety, reference should be made to the relevant parts of AS 2243 and AS 2508.