AS 1038.14.2—1995

Australian Standard®

# Coal and coke—Analysis and testing

## Part 14.2: Higher rank coal ash and coke ash—Major and minor elements—Acid digestion/flame atomic absorption spectrometric method

This Australian Standard was prepared by Committee MN/1, Coal and Coke. It was approved on behalf of the Council of Standards Australia on 22 December 1994 and published on 5 April 1995.

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The following interests are represented on Committee MN/1:

Australasian Institute of Mining and Metallurgy
Australian Chamber of Commerce and Industry
Australian Coal Association
Australian Coal Industry Research Laboratories
Australian Coal Preparation Society
Australian Institute of Energy
Australian Mining Industry Council
Bureau of Steel Manufacturers of Australia
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Institution of Engineers, Australia
Queensland Coal Board
Royal Australian Chemical Institute
Standing Committee on Coalfield Geology of New South Wales
University of Newcastle
University of New South Wales
University of Queensland

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# PREFACE

This Standard was prepared by the Standards Australia Subcommittee on Coal Evaluation, under the direction of the Committee on Coal and Coke, as a revision of AS 1038.14.2—1985, *Methods for the analysis and testing of coal and coke*, Part 14.2: *Analysis of higher rank coal ash and coke ash (Acid digestion—Flame atomic absorption spectrometric method)*. It is a companion Standard to AS 1038.14.1, *Coal and coke—Analysis and testing*, Part 14.1: *Higher rank coal ash and coke ash—Major and minor elements—Borate fusion/flame atomic absorption spectrometric method*. Whereas Part 14.1 specifies decomposition of the ash by borate fusion, this Standard sets out a bomb digestion procedure using a hydrochloric acid/hydrofluoric acid mixture for the decomposition of coal ash and coke ash, followed by flame atomic absorption spectrometry for the determination of various elements in the ash.

By convention, sulfur is included in the normal ash constituent analysis.

Phosphorus could be also determined spectrophotometrically in the solution prepared from the ash. Sulfur can be determined by the high temperature procedure.

Major differences from the previous edition are as follows:

(a) Correction of the concentration of boric acid solution.

(b) Deletion of details of the method for determination of phosphorus. This method is now the subject of AS 1038.9.3.

(c) Correction of the volume of acid matrix base solution used in preparing calibration solutions.

(d) Inclusion of reference to the determination of sulfur.

The objective of this Standard is to provide those responsible for the analysis of coal ash and coke ash with a uniform method for the procedure.

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

CONTENTS




Originated as AS 1038.14.2—1985.
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STANDARDS AUSTRALIA

# Australian Standard

# Coal and coke—Analysis and testing

## Part 14.2: Higher rank coal ash and coke ash—Major and minor elements—Acid digestion/flame atomic absorption spectrometric method

**1 SCOPE** This Standard sets out methods for the determination of silicon, aluminium, iron, calcium, magnesium, sodium, potassium, titanium and manganese in higher rank coal ash and coke ash by flame atomic absorption spectrometry after acid digestion.

NOTE: Although a volumetric approach has been specified for solution preparation, a gravimetric alternative may be used.

A spectrophotometric method for the determination of phosphorus and a method for the determination of sulfur are also referenced.

This method is applicable to the determination of the elements listed in Clause 1 (expressed as oxides), in the concentration ranges specified in Table 1.

Table 1 has been devised to accommodate any type of ash that is likely to arise from Australian higher rank coals or cokes.

NOTE: The results in Appendix A have been obtained from test work carried out on the available samples. Although testing was not carried out with a comprehensive range of likely coal compositions, the method is expected to apply over the wider ranges covered by the calibration standards and indicated in Table 1.

**TABLE 1**

**CONCENTRATION RANGES**

| Element | Reported as oxide | Range, % | | |
|---|---|---|---|---|
| Silicon | $SiO_2$ | 20 | to | 85 |
| Aluminium | $Al_2O_3$ | 10 | to | 50 |
| Iron | $Fe_2O_3$ | 0.1 | to | 15 |
| Calcium | CaO | 0.05 | to | 25 |
| Magnesium | MgO | 0.05 | to | 25 |
| Sodium | $Na_2O$ | 0.05 | to | 12.5 |
| Potassium | $K_2O$ | 0.05 | to | 12.5 |
| Titanium | $TiO_2$ | 0.1 | to | 5 |
| Manganese | $Mn_3O_4$ | 0.005 | to | 0.6 |
| Phosphorus | $P_2O_5$ | 0.01 | to | 5 |
| Sulfur | $SO_3$ | 0.1 | to | 10 |