Australian Standard®

Higher rank coal and coke—Bulk density

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Australian Coal Association
Australian Coal Industry Research Laboratories
Australian Coal Preparation Society
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PREFACE

This Standard was prepared by the Standards Australia Subcommittee on Coal Preparation, under the supervision of the Committee on Coal and Coke and the direction of the Minerals Standards Board.

The hopper-filled box method and the uncompacted box method for the determination of bulk density of higher rank coal are new methods.

The measuring cylinder method for higher rank coal has been transferred from AS 1038.12.2—1980, *Methods for the analysis and testing of coal and coke*, Part 12.2: *Assessment of coking power of hard coal: Gray-King coke type test*, which has been revised.

The method for the determination of the bulk density of coke has been transferred from AS 1038.13—1976, *Methods for the analysis and testing of coal and coke*, Part 13: *Tests special to coke*, which has been revised.

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FOREWORD

The bulk density of coal depends upon its physical characteristics, i.e. apparent relative density and shape of particles, the dimensions of the container, the size distribution of the coal particles and their moisture content.

Results for bulk density will change according to variations in the above characteristics. In practice, results can be considered under three main headings:

(a) *As poured*—the bulk density that results from pouring the material into a heap or container in the absence of compacting forces.

(b) *Compacted*—the bulk density created by the application of compacting forces, e.g. impact or vibration.

(c) *Aerated**—the bulk density created when particles are separated from each other by an air film. (Applies only to fine, dry powders.)

In any bulk density measurement, the test conditions should simulate or represent, as closely as possible, the actual conditions under which the bulk density needs to be known, as the method used will influence the result†. The method used to determine bulk density has to be specified in the test report.

* A brief description of this procedure is given in *Bulk solids physical properties test guide*, British Materials Handling Board, 1983.

† CSIRO Report TC 19, *The control of bulk density by moisture and oil addition*, August 1957.

STANDARDS AUSTRALIA

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1 SCOPE This Standard sets out methods for the determination of the bulk density of crushed higher rank coal and coke.

Three methods are described for the determination of the bulk density of higher rank coal, viz.:

(a) Hopper-filled box method, for coal less than 5.6 mm nominal top size, applicable to crushed coals to be used as coke oven feed.

(b) Uncompacted box method, for coal less than 45 mm nominal top size (see Note to Clause 4.3.3(a)).

(c) Measuring cylinder method, for coal typically less than 63 μm, as used in pulverized fuel-fired boilers and cement kilns.

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS
1038 Methods for the analysis and testing of coal and coke
1038.1 Part 1: Total moisture in hard coal
1038.2 Part 2: Total moisture in coke
1038.12.2 Part 12.2: Carbonization properties of higher rank coal—Determination of Gray-King coke type
1038.13 Part 13: Tests specific to coke

2096 Classification and coding systems for Australian coals

2646 Sampling of solid mineral fuels
2646.2 Part 2: Hard coal—Sampling from moving streams
2646.3 Part 3: Coke—Sampling from moving streams
2646.4 Part 4: Hard coal—Sampling from stationary situations
2646.5 Part 5: Coke—Sampling from stationary situations
2646.6 Part 6: Hard coal—Preparation of samples
2646.7 Part 7: Coke—Preparation of samples

2706 Numerical values—Rounding and interpretation of limiting values

3 DEFINITIONS For the purpose of this Standard, the definitions below apply.

3.1 Bulk density of higher rank coal—the mass of a unit volume of higher rank coal, including the voids within and between the particles, measured under standard conditions.

3.2 Bulk density of coke—the mass per unit volume of dry coke, as determined in a standard container using a standardized procedure.

NOTE: The preferred unit for bulk density of coke is kilograms per cubic metre.

3.3 Higher rank coal (as defined in AS 2096)—coal having a gross specific energy of 21.00 MJ/kg or greater on an ash-free, moist basis *and* 27.00 MJ/kg or greater on a dry, ash-free basis.

4 DETERMINATION OF BULK DENSITY OF HIGHER RANK COAL

4.1 General Samples containing fines will show significant variations in bulk density with variations in moisture. Care should be taken to ensure that moisture in the test sample is representative of the gross sample.

4.2 Hopper-filled box method*

4.2.1 Principle The bulk density is measured after dropping a coal sample from a small, fixed height into a weighed box of known volume, and then determining the mass of coal required to fill the box completely.

4.2.2 *Samples* Samples required are as follows:

(a) *Gross sample* Coal samples shall be collected in accordance with AS 2646.2 or AS 2646.4. During the collection of the gross sample, the increments of the sample shall be stored in an air-tight container to prevent loss of moisture. The minimum mass of sample for bulk density shall be 150 kg—sufficient for four replicate determinations and for the concurrent determination of size analysis and total moisture.

* The results from this method are comparable with those using ASTM D 291—*Cubic foot weight of crushed bituminous coal—Procedure A.*