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METHODS FOR THE ANALYSIS AND TESTING OF COAL AND COKE

Part 12.3—DETERMINATION OF THE DILATOMETER CHARACTERISTICS OF HIGHER RANK COAL

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Australian Coal Association
Australian Coal Industry Research Laboratories Ltd
Australian Institute of Energy
Australasian Institute of Mining and Metallurgy
Bureau of Steel Manufacturers of Australia
Coal Preparation Societies of N.S.W. and Queensland
Confederation of Australian Industry
CSIRO, Division of Fossil Fuels
Department of Minerals and Energy, Victoria
Department of Mineral Resources, N.S.W.
Department of Mines, Queensland
Department of Resources and Energy
Electricity Supply Association of Australia
Institution of Engineers, Australia
Joint Coal Board
Queensland Coal Board
Royal Australian Chemical Institute
Standing Committee on Coalfield Geology, N.S.W.
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B.H.P. Central Research Laboratories
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PREFACE

This standard was prepared by the Association's Committee on Coal and Coke under the direction of the Minerals Standards Board. It describes procedures for determining the dilatometer characteristics of higher rank coal using either a metal-core furnace or an air-core furnace. It is based on ISO 349 (1975), Hard Coal—Audibert-Arnu Dilatometer Test, DIN 51739 (1976), Testing of Solid Fuels: Determination of the Dilatation of Coal, and BS 1016 (1980), Methods for Analysis and Testing of Coal and Coke, Part 12—Caking and Swelling Properties of Coal. Solid core furnaces are specified in all these standard methods.

This test measures the swelling properties of the coal under different conditions to the crucible swelling number test (AS 1038, Part 12.1), whereas the Gray-King coke type test (AS 1038, Part 12.2) assesses the caking properties of the coal.

The precision data reported in Clause 9 have been taken directly from ISO 349. Testwork is being carried out to evaluate the precision of the method for Australian coal.

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

METHODS FOR THE ANALYSIS AND TESTING OF COAL AND COKE

PART 12.3—DETERMINATION OF THE DILATOMETER CHARACTERISTICS OF HIGHER RANK COAL

1 SCOPE. This standard sets out a method for obtaining a quantitative measure of the swelling properties of higher rank coal (i.e. coal with a specific energy > 27 MJ/kg on a dry, ash-free basis) when heated under standard conditions in a dilatometer.

2 REFERENCED DOCUMENTS. The following standards are referred to in this standard:

AS 1038 Methods for the Analysis and Testing of Coal and Coke
Part 16—Reporting of Results

AS 1152 Test Sieves

AS 2418 Glossary of Terms Relating to Solid Mineral Fuels

AS 2646 Sampling of Solid Mineral Fuels.

3 PRINCIPLE. A pencil prepared by compressing a finely ground coal sample is heated at a constant rate in a calibrated steel retort in a furnace. The vertical displacement of a piston resting upon the pencil is recorded continuously as a function of time, and hence temperature. This curve is characteristic of the swelling properties of the coal. From this curve the maximum upwards and downwards displacements (expressed as percentages of the original length of the pencil) and three characteristics temperatures are determined.

4 DEFINITIONS. For the purpose of this standard, the definitions given in AS 2418 and the following apply:

4.1 Temperature of initial contraction—the temperature at which the downward movement of the dilatometer piston is 0.5 mm (see T_1 in Fig. 1).

4.2 Temperature of maximum contraction—the temperature at which the dilatometer piston reaches its lowest point (see T_2 in Fig. 1).

4.3 Temperature of maximum dilatation—the temperature at which the dilatometer piston reaches its highest point (see T_3 in Fig. 1).

4.4 Maximum contraction—the maximum downward movement of the dilatometer piston, measured from the zero point and expressed as a percentage of the initial pencil length (see Fig. 1(c)). However, if the final trace of the curve is not truly horizontal but slopes downward, the maximum contraction shall be the value observed at 550°C (see Fig. 1(d)).

4.5 Maximum dilatation—the maximum upward movement of the dilatometer piston after contraction, measured from the zero point and expressed as a percentage of the initial pencil length. The value can be either positive or negative (see Fig. 1).

4.6 Parallel dilatometer tests—tests carried out simultaneously on two coal pencils prepared at the same time from a single coal sample and treated in two retorts in the same furnace during a single heating cycle.

4.7 Duplicate dilatometer tests—tests carried out at different times on two coal pencils prepared before each heating cycle from a single coal sample and treated in the same retort in the same furnace in independent heating cycles by the same operator.

4.8 Repeatability—the maximum acceptable difference between two determinations which are carried out simultaneously (parallel tests) or at different times (duplicate tests) in the same laboratory by the same operator with the same apparatus on the same analysis sample.

4.9 Reproducibility—the difference between the mean of acceptable duplicate determinations carried out at one laboratory and the mean of acceptable duplicate determinations carried out at any other laboratory, on representative subsamples, at a nominal top size of 425 μm or more, taken from the same gross sample.

5 APPARATUS.

5.1 Mould and accessories.

5.1.1 *Mould* (see Fig. 2). A mould, preferably made from case-hardened steel, or some other suitably hard metal or alloy after machining. The bore shall be polished after hardening, and the bore and uniformity of taper shall conform to the dimensions given in Table 1.