

Australian Standard 2486—1981

MICROSCOPICAL DETERMINATION OF THE REFLECTANCE OF COAL MACERALS



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Australian Coal Association
Australian Institute of Energy
Australasian Institute of Mining and Metallurgy
Bureau of Steel Manufacturers of Australia
Coal Preparation Societies of New South Wales and Queensland
Confederation of Australian Industry
Department of Minerals and Energy, Vic.
Department of Mineral Resources, N.S.W.
Department of National Development & Energy
Electricity Supply Association of Australia
Institution of Engineers, Australia
Joint Coal Board
Queensland Coal Board
Royal Australian Chemical Institute
Universities

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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 Committee. It is based on the ISO Draft International Standard for the microscopical determination of the reflectance of vitrinite but has been expanded to include reference to the measurement of the reflectance of all coal macerals.

The properties of a given coal are determined by the proportions and associations of the petrographic components present and by the rank of the coal. One property which can be used as a parameter of rank, independent of the petrographic composition, is the reflectance of the coal macerals which increases progressively with increasing degree of coalification. This standard outlines methods specifically designed for the measurement of vitrinite reflectance. These methods are also applicable to the measurement of reflectance of other coal macerals.

In addition to its use in determining the rank of coal, vitrinite reflectance is measured for technological purposes such as determining the composition of coal blends and to predict the behaviour of a coal when processed. The procedure adopted for measuring vitrinite reflectance differs depending on the purpose for which the measurement is made. Therefore, in reporting the results it is important to specify which procedure was used.

As the vitrinite reflectance varies in a coal, it is necessary to ensure that a representative sample is prepared either as a series of vertical lump sections from a seam or more frequently as a particulate block, and that a sufficient number of measurements are made in accordance with an unbiased sampling procedure.

This standard requires reference to the following standards:

- AS 2061 Code of Practice for the Preparation of Hard Coal Samples for Microscopical Examination By Reflected Light
- AS 2418 Glossary of Terms Relating to Solid Mineral Fuels
Part 5—Terms Relating to the Petrographic Analysis of Bituminous Coal and Anthracite (Hard Coal)

15 SEP 1981



STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard

METHODS FOR MICROSCOPICAL DETERMINATION OF THE REFLECTANCE OF COAL MACERALS

1 SCOPE. This standard sets out methods for the microscopical determination of the maximum and random reflectance in oil of polished surfaces of coal macerals. The methods are applicable to the characterization of either coals from single seams or coal blends covering the whole rank range from brown coal to anthracite.

NOTES:

1. Reflectance measurements on coal macerals obtained by interpreting the results of a computerized automated system of microscopic analysis are outside the scope of this standard.
2. If measurements are made in a medium other than oil, e.g. air, this should be stated.

2 APPLICATION. The procedures described in this standard may be used for the following applications:

- (a) Exploration and preliminary assessment of coal quality.
- (b) Technological purposes and quality control.
- (c) Determination of thermal maturation index for petroleum exploration.

3 DEFINITIONS. For the purpose of this standard, the definitions given in AS 2418 Part 5, as well as the following definitions, apply:

Repeatability of reflectance measurements—the absolute difference between the means of two sets of reflectance measurements, each based on the same number of observations, carried out within one laboratory on the same sample, within which 95 percent of such differences would be expected to lie.

Reproducibility of reflectance measurements—the absolute difference between the means of two sets of reflectance measurements, each based on the same number of observations, carried out in two different laboratories on different subsamples of the same sample, within which 95 percent of such differences would be expected to lie.

$\bar{R}_{V, \max}$ —mean maximum reflectance of vitrinite in oil.

\bar{R}_V —mean random reflectance of vitrinite in oil.

$\bar{R}_{I, \max}$ —mean maximum reflectance of exinite and liptinite in oil.

\bar{R}_I —mean random reflectance of exinite and liptinite in oil.

$\bar{R}_{I, \max}$ —mean maximum reflectance of inertinite in oil.

\bar{R}_I —mean random reflectance of inertinite in oil.

4 PRINCIPLE. The reflectance at near normal incidence of a specified area of the maceral under test is measured under oil immersion using a photomultiplier and compared with reflectance measurements made under identical conditions on a set of standards of known reflectance. Because different maceral particles within a single coal seam invariably differ slightly from one another in optical properties, a suitable number of readings on different particles must be taken to ensure that the results are representative.

5 MATERIALS.

5.1 Polished Block. The polished block shall be prepared in accordance with AS 2061.

5.2 Immersion Oil. The immersion oil shall be a non-drying, non-fluorescent, non-corrosive type with a refractive index of 1.5180 ± 0.0004 at 23°C and a wavelength of 546 nm. The temperature coefficient ($-dn/dt$) shall be less than $0.0005/^\circ\text{C}$.

NOTE: Oil should not be used more than 1 year after the bottle was opened unless the refractive index has been checked and found within specification.

5.3 Calibration Standards.

5.3.1 Reflectance standards. Reflectance standards shall consist of polished surfaces of materials which are:

- (a) Isotropic (or basal sections of uniaxial minerals).
- (b) Durable and resistant to corrosion.
- (c) Constant in reflectance over a long period.
- (d) Free from inclusions, grain boundaries, discontinuities, internal flaws and fractures.
- (e) Low in absorptive index.