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BSI Standards Publication

## Methods for the petrographic analysis of coals

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Part 4: Method of determining microlithotype,  
carbominerite and minerite composition

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## National foreword

This British Standard is the UK implementation of ISO 7404-4:2017. It supersedes BS 6127-4:1990, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PTI/16, Solid mineral fuels.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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## **Methods for the petrographic analysis of coals —**

### **Part 4: Method of determining microlithotype, carbominerite and minerite composition**

*Méthodes d'analyse pétrographique des charbons —*

*Partie 4: Détermination de la composition en microlithotypes,  
carbominérites et minérites*



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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee TC 27, *Solid mineral fuels*, Subcommittee SC 5, *Methods of analysis*.

This second edition cancels and replaces the first edition (ISO 7404-4:1988), which has been technically revised.

A list of all the parts in the ISO 7404 series can be found on the ISO website.

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## Introduction

Petrographic analyses have been recognized internationally as important in the context of the genesis, vertical and lateral variation, continuity, metamorphism and usage of coal. The International Committee for Coal Petrology (ICCP) has made recommendations concerning nomenclature and analytical methods and has published and described in detail the characteristics of a wide range of coals. This document agrees substantially with the text of relevant ICCP publications and incorporates many useful comments made by members of the ICCP and by member bodies of ISO/TC 27.

Petrographic analyses of a single coal provide information about the rank, the maceral and microlithotype compositions and the distribution of mineral matter in the coal. The reflectance of vitrinite is a useful measure of coal rank and the distribution of the reflectance of vitrinite in a coal blend, together with a maceral group analysis, can provide information about some important chemical and technological properties of the blend.

The ISO 7404 series is concerned with the methods of petrographic analysis currently employed in characterizing coal in the context of its technological and/or geological use. It establishes a system for petrographic analysis and comprises five parts, see ISO website:

Microlithotypes are the naturally occurring associations of macerals which characterize the microscopically visible different types of coal. By convention, the identity of a microlithotype is determined by the maceral group or groups occurring within an area of at least  $50\ \mu\text{m} \times 50\ \mu\text{m}$  and which are present in amounts equal to or exceeding 5 % by volume. Hence, they can comprise a single maceral or maceral group if it exceeds these dimensions. Microlithotypes may include up to 20 % by volume of minerals such as clay, quartz and carbonates or up to 5 % by volume of sulfide minerals. If the content of mineral matter exceeds these amounts, the material is designated as minerite or carbominerite depending on the proportions of coal and mineral matter.

Carbominerites can be subdivided according to the type of mineral matter.

Microlithotypes contribute information on the genesis of coal seams and can assist in solving problems of seam correlation. Because they determine, together with rank and mineral matter, the hardness and density of the bulk coal substance, microlithotypes affect the behaviour of coal in mining and coal preparation processes. The different microlithotypes determine, under given geological conditions, the distribution of micro-cracks and to some extent the cleat in the coal. The results of maceral analyses can be interpreted more meaningfully from a knowledge of microlithotype composition. Such information can assist in explaining the behaviour of coal in commercial and experimental utilization processes where the association of macerals is known to be important.

**NOTE** The percentage volume of carbonate, clay and quartz minerals on the one hand and sulfide minerals on the other, which define the carbominerites and minerites, correspond to the densities which separate acceptable coal from middlings ( $1,5\ \text{g/cm}^3$ ) and from rejects in coal preparation.

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# Methods for the petrographic analysis of coals —

## Part 4:

# Method of determining microlithotype, carbominerite and minerite composition

## 1 Scope

This document specifies a method, using a graticule with 20 crossline intersections, for determining the proportions of microlithotypes, carbominerite and minerite in coals. It applies only to determinations made on polished particulate blocks using reflected white light (about 400 nm to 700 nm). Additional blue, blue-violet or UV light excitation (365 nm to 440 nm) for better identification of liptinite in fluorescence may be used especially at low rank coals.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7404-1, *Methods for the petrographic analysis of coals — Part 1: Vocabulary*

ISO 7404-2, *Methods for the petrographic analysis of coals — Part 2: Methods of preparing coal samples*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7404-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <http://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

### 3.1

#### point

observation of a portion of the particulate block through the eyepiece graticule made during the analysis

Note 1 to entry: The allocation of a point to a particular microlithotype, or to carbominerite or minerite, is determined by the macerals and/or mineral matter present at the 20 intersections of the graticule. A point is only counted if at least 10 intersections fall on a particle.

## 4 Principle

Examination by using a reflected light microscope and point count procedure of a representative sample of coal prepared as a particulate block as described in ISO 7404-2. Identification under an immersion medium of the microlithotypes from their maceral composition. The proportions of the macerals are determined using a graticule having a grid with 20 points of intersection spaced to define a distance of 50 µm on the specimen between extreme intersections in the x (abscissa) and y (ordinate) directions, respectively. The use of such a graticule allows the analyst to comply with the 5 % minimum content and 50 µm minimum size stipulation.