

BS ISO 22493:2014



BSI Standards Publication

# Microbeam analysis — Scanning electron microscopy — Vocabulary

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**National foreword**

This British Standard is the UK implementation of ISO 22493:2014. It supersedes BS ISO 22493:2008 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee CII/9, Microbeam analysis.

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

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**Microbeam analysis — Scanning  
electron microscopy — Vocabulary**

*Analyse par microfaisceaux — Microscopie électronique à balayage  
— Vocabulaire*



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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)).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 202, *Microbeam analysis*, Subcommittee SC 1, *Terminology*.

This second edition cancels and replaces the first edition (ISO 22493:2008), of which it constitutes a minor revision.

## Introduction

The scanning electron microscopy (SEM) technique is used to observe and characterize the surface morphology and structure of solid materials, such as metal alloys, ceramics, glasses, minerals, polymers, powders, etc., on a spatial scale of micrometer down to nanometer laterally. In addition, three-dimensional structure can be generated by using a combination of focused ion beam and scanning-electron-based analysis techniques. The SEM technique is based on the physical mechanism of electron optics, electron scattering and secondary electron emission.

As a major sub-field of microbeam analysis (MBA), the SEM technique is widely applied in diverse sectors (high-tech industries, basic industries, metallurgy and geology, biology and medicine, environmental protection, trade, etc.) and has a strong business base that needs standardization.

Standardizing the terminology of a technical field is one of the basic prerequisites for development of standards on other aspects of that field.

This International Standard is relevant to the need for an SEM terminology that contains consistent definitions of terms as they are used in the practice of scanning electron microscopy by the international scientific and engineering communities that employ the technique. This International Standard is the second one developed in a package of standards on electron probe microanalysis (EPMA), scanning electron microscopy (SEM), analytical electron microscopy (AEM), energy-dispersive X-ray spectroscopy (EDS), etc., developed or to be developed by Technical Committee ISO/TC 202, *Microbeam analysis*, Subcommittee SC 1, *Terminology*, to cover the complete field of MBA.





# Microbeam analysis — Scanning electron microscopy — Vocabulary

## 1 Scope

This International Standard defines terms used in the practice of scanning electron microscopy (SEM). It covers both general and specific concepts, classified according to their hierarchy in a systematic order, with those terms that have already been defined in ISO 23833 also included, where appropriate.

This International Standard is applicable to all standardization documents relevant to the practice of SEM. In addition, some clauses of this International Standard are applicable to documents relevant to related fields (e.g. EPMA, AEM, EDS) for the definition of terms which are relevant to such fields.

## 2 Abbreviated terms

AEM	analytical electron microscope/microscopy
BSE (BE)	backscattered electron
CPSEM	controlled pressure scanning electron microscope/microscopy
CRT	cathode ray tube
EBIC	electron beam induced current
EBSD	electron backscatter/backscattering diffraction
EDS	energy-dispersive spectrometer/spectrometry
EPMA	electron probe microanalyser/analysis
ESEM	environmental scanning electron microscope/microscopy
FWHM	full width at half maximum
SE	secondary electron
SEM	scanning electron microscope/microscopy
VPSEM	variable-pressure scanning electron microscope/microscopy

## 3 Terms and definitions used in the physical basis of SEM

### 3.1

#### **electron optics**

science that deals with the passage of electrons through electrostatic and/or electromagnetic fields

#### 3.1.1

##### **electron source**

device that generates electrons necessary for forming an electron beam in the electron optical system

##### 3.1.1.1

###### **energy spread**

diversity of energy of electrons