

Determination of the specific surface area of powders —

Part 1: BET method of gas adsorption
for solids (including porous materials)

ICS: 19.120

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
Documents

AVA

Document Sharing Hub

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee LBI/37, Sieves, screens and particle sizing, to Subcommittee LBI/37/4, Sizing by methods other than sieving, upon which the following bodies were represented:

- BLWA Ltd. (The Association of the Laboratory Supply Industry)
- British Fluid Power Association
- GAMBICA (BEAMA Ltd.)
- Institution of Chemical Engineers
- Loughborough University of Technology
- Ministry of Defence (Defence Research Agency)
- NABIM
- Royal Pharmaceutical Society of Great Britain
- Royal Society of Chemistry
- Society of Chemical Industry
- Society of Cosmetic Scientists
- University of Bradford

This British Standard, having been prepared under the direction of the Sector Board for Materials and Chemicals, was published under the authority of the Standards Board and comes into effect on 15 April 1996

© BSI 06-1999

The following BSI references relate to the work on this standard:
Committee reference LBI/37/4
Draft for comment 92/81847 DC

ISBN 0 580 25505 0

Amendments issued since publication

Amd. No.	Date	Comments

Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
1 Scope	1
2 Normative reference	1
3 Definitions	2
4 Symbols and units	2
5 Principle	3
6 Procedure	3
7 Evaluation of adsorption data	7
8 Test report	8
9 Use of reference materials	8
Annex A (informative) Certified reference materials	9
Annex B (informative) Bibliography	9
Figure 1 — IUPAC classification of adsorption isotherms	1
Figure 2 — Particle with surface detected by the adsorption method shown by dotted line	3
Figure 3 — Thermogravimetric control of degassing	4
Figure 4 — Pressure control of degassing	4
Figure 5 — Volumetric method	5
Figure 6 — Gravimetric method	6
Figure 7 — Carrier gas method	6
Figure 8 — BET plot	7
Table 1 — Symbols	2
List of references	Inside back cover

National foreword

This Part of BS 4359 has been prepared by Subcommittee LBI/37/4. This Part of BS 4359 replaces BS 4359-1:1984, which is withdrawn. It is identical with ISO 9277:1995 *Determination of the specific surface area of solids by gas adsorption using the BET method* published by the International Organization for Standardization (ISO). ISO 9277 has been prepared by Subcommittee 4 of Technical Committee ISO/TC 24, with the active participation and approval of the United Kingdom.

It should be noted that the scope of this Part of BS 4359 is wider than that of its predecessor, as the scope of ISO 9277 includes the surface area determination of porous solids.

Other Parts of BS 4359 are:

- *Part 2: Recommended air permeability methods;*
- *Part 4: Recommendations for methods of determination of metal surface area using gas adsorption techniques.*

This Part of BS 4359 describes gas adsorption (BET) methods only and should not be used or quoted as a specification. References to this standard should indicate that the methods used are in accordance with BS 4359-1:1996.

This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

In particular, attention is drawn to the Health and Safety Executive Control of Substances Hazardous to Health (COSHH) Regulations (1994).

The subcommittee has reviewed the provisions of ISO 8213:1986, to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

Attention is also drawn to BS 3406-1:1986, which provides guidance on powder sampling.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

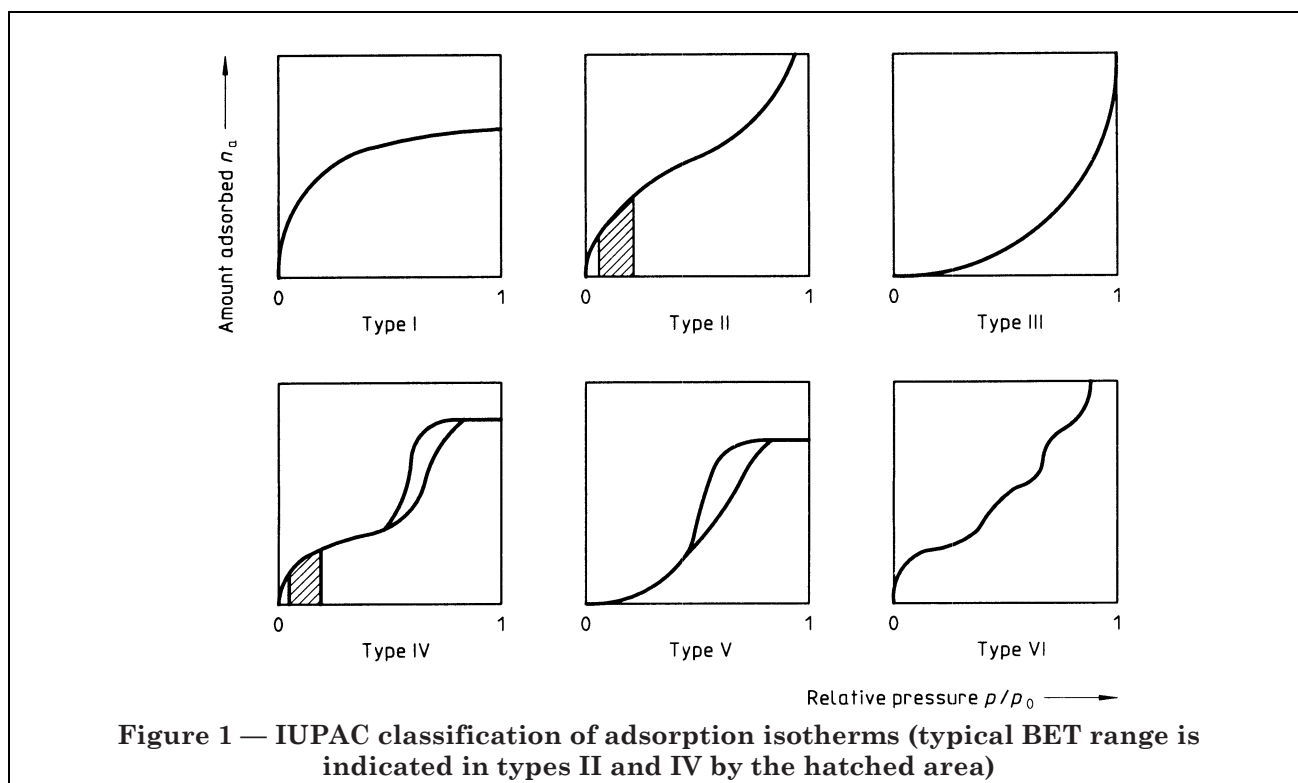
1 Scope

This International Standard specifies the determination of the total¹⁾ specific external and internal surface area of disperse or porous solids by measuring the amount of physically adsorbed gas according to the method of Brunauer, Emmett and Teller (BET method) [1], based on the 1984 IUPAC Recommendations [2].

The BET method is applicable only to adsorption isotherms of type II (disperse, nonporous or macroporous solids) and type IV (mesoporous solids, pore diameter between 2 nm and 50 nm) (see Figure 1). Inaccessible pores are not detected. The BET method cannot reliably be applied to type I isotherms or to solids which absorb the measuring gas.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards. ISO 8213:1986, *Chemical products for industrial use — Sampling techniques — Solid chemical products in the form of particles varying from powders to coarse lumps*.



¹⁾ For solids exhibiting a chemically heterogeneous surface, e.g. metal-carrying catalysts, the BET method gives the total surface area, whereas the metallic portion of the surface area may be measured by chemisorption methods.