Australian Standard™

# Alumina

## Part 4: Determination of specific surface area by nitrogen adsorption

Standards Australia

This Australian Standard was prepared by Committee MN-009, Alumina and Materials used in Aluminium Production. It was approved on behalf of the Council of Standards Australia on 14 March 2003 and published on 25 March 2003.

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The following are represented on Committee MN-009:

Australasian Institute of Mining and Metallurgy

Australian Aluminium Council

Minerals Council of Australia

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# Part 4: Determination of specific surface area by nitrogen adsorption

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## PREFACE

This Standard was prepared by the Standards Australia Committee MN-009, Alumina and Materials used in Aluminium Production, to supersede AS 2879.4—1991.

The major change in this edition is the inclusion of a multi-point method.

This Standard is one of a series of Standards for the testing of alumina.

The term ‘informative’ has been used in this Standard to define the application of the appendix to which it applies. An ‘informative’ appendix is only for information and guidance.

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## CONTENTS

# FOREWORD

In the development of this method, the temperature for degassing (150°C) was chosen after testing various smelter-grade aluminas (SGAs). It was found that temperatures above 150°C changed the state of some samples with respect to the surface area, presumably through the partial calcination of the hydrated alumina, which is present to some degree in smelter-grade alumina.

Modern instruments now allow multi-point surface area analysis to be carried out easily. It is recommended a multi-point surface area analysis be carried out whenever possible but single-point analysis is still acceptable. The test report should indicate whether the result is a single-point or multi-point result.

STANDARDS AUSTRALIA

# Australian Standard
# Alumina

## Part 4: Determination of specific surface area by nitrogen adsorption

## 1 SCOPE

This Standard sets out an instrumental method for the determination of specific surface area (SSA) of smelter-grade alumina by nitrogen adsorption by a single or multi-point method. A multi-point method is recommended due to the higher accuracy obtained; if a single point method is used a lower result will be obtained.

NOTE: Appendix A provides an explanation why this is the case.

The Standard is applicable to aluminas having a surface area between 50 $m^2/g$ and 90 $m^2/g$.

## 2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

2243 Safety in laboratories (series)

2850 Chemical analysis—Interlaboratory test programs—For determining precision of analytical method(s)—Guide to the planning and conduct

4538 Guide to the sampling of alumina

4538.2 Part 2: Preparation of samples

## 3 PRINCIPLE

The method is based on the ability of a material to adsorb nitrogen molecules on its surface at the boiling point of liquid nitrogen. The instrument determines the quantity of nitrogen gas necessary to form a monolayer of gas molecules on the sample surface. The surface area can then be calculated based on the basic theory by Brunauer-Emmett-Teller.* A test sample is degassed at 150°C. The degassing process can be carried out using either vacuum or a flowing nitrogen stream. After degassing, the sample is weighed. This mass, and the monolayer volume determined by the instrument, is used to calculate the specific surface area.

## 4 SAFETY

For information on laboratory safety, reference should be made to the relevant parts of AS 2243.

CAUTION: CARE SHOULD BE TAKEN WHEN HANDLING CRYOGENIC LIQUIDS.

## 5 REAGENTS

### 5.1 Liquid nitrogen

With a boiling point of −196°C at 1 atm. pressure (101.3 kPa).

* S. BRUNAUER, P.H. EMMETT and E. TELLER, *J. Am Chem. Soc.* 60, p.309 (1938).

 