Australian Standard™

# Alumina

## Part 10: Determination of attrition index



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 11 November 2003 and published on 29 December 2003.

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Australasian Institute of Mining and Metallurgy

Australian Aluminium Council

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*This Standard was issued in draft form for comment as DR 01268.*

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First published as AS 2879.10—2003.



Published by Standards Australia International Ltd
GPO Box 5420, Sydney, NSW 2001, Australia

ISBN 0 7337 5639 5

# PREFACE

This Standard was prepared by the Standards Australia Committee, MN-009 Alumina and Materials used in Aluminium Production, as an extension to the AS 2879 series of Standards for the testing of alumina.

The procedure is based on Alcoa's modification of the Forsyth-Hartwig procedure. Flow calibrations are based on the Alcan International procedure 139-96, *Semi-automatic determination of the attrition index of alumina and alumina trihydrate.*

The objective of this Standard is to provide those responsible for the testing of alumina with a standardized procedure for measuring the attrition index.

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.

CONTENTS

# FOREWORD

Attrition index is an empirical measurement used to assess the resistance of an alumina to mechanical breakdown. The method involves fluidizing a known mass of sample in a vertical column using a high-velocity air jet through an orifice plate having a 400 μm hole. The change in the +45 micron content of the alumina that results from particle-particle and particle-wall interactions in the column is used to calculate the index.

The diameter of the orifice and flow configuration is known to be critical in determining the velocity of the air entering the attrition column and is a large contributor to variations in measurements between laboratories. Apparatus variations can be overcome by calibrating with a standard alumina.

STANDARDS AUSTRALIA

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## Part 10: Determination of attrition index

## 1 SCOPE

This Standard sets out a procedure for the determination of the attrition index of smelter-grade alumina.

## 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 |
| 2879 | Alumina |
| 2879.6 | Part 6: Determination of the mass distribution of particle sizes using electroformed sieves |
| 4538 | Guide to the sampling of alumina |
| 4538.2 | Part 2: Preparation of samples |

## 3 PRINCIPLE

A test portion is attrited using a high velocity gas jet under controlled conditions using the attrition index apparatus. Flow in the apparatus is calibrated to a reference alumina. The particle size distribution is measured before and after attrition. The attrition index is the relative percentage decrease in the +45 µm fraction under specific test conditions.

## 4 SAFETY

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

## 5 APPARATUS

### 5.1 Attrition index apparatus

A typical assembled apparatus is shown in Figure 1 which consists of:

a) *Column*

Stainless steel, aluminium and glass columns of length 1500–1600 mm and inside diameter 25 mm have been tested and found to be suitable. To minimize dust carryover, columns with larger diameter upper sections are also suitable. A column of reduced overall length (700 mm) and upper diameter 64 mm has also been found to be suitable. In any case modified columns shall maintain the 25 mm ID for a minimum of 200 mm from the orifice plate. Also they shall be constructed with a smooth tapered transition between sections to ensure that alumina is not held up in the upper section of the column. Columns may also be provided with a timed automated rapper to facilitate rapping the column (see Clause 7.2(f)).