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**Carbonaceous materials for the
production of aluminium — Cold and
tepid ramming pastes —
Expansion/shrinkage during baking**

*Produits carbonés utilisés pour la production de l'aluminium — Pâtes de
brasquage froides et tièdes — Expansion/rétrécissement durant la
cuisson*



Reference number
ISO 14428:2005(E)

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Foreword

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ISO 14428 was prepared by Technical Committee ISO/TC 226, *Materials for the production of primary aluminium*.

This corrected version of ISO 14428:2005 incorporates the following correction:

- The publication date has been changed to 2005.

Introduction

The expansion/shrinkage of ramming pastes used in the production of aluminium is an important property, because excessive shrinkage can cause cracks in the baked paste serving as a lining material in alumina electrolysis cells. These cracks can cause leakage of the liquid bath, destroying the sidewall lining and the steel shell and thus leading to shut-down of the cell. Ramming pastes change phase from plastic to non-plastic between 400 °C and 600 °C (200 °C and 300 °C for resin binders). The shrinkage which occurs between the temperature at which the paste becomes non-plastic and the operating temperature (950 °C) is an important factor. Apparent shrinkage in the viscous range is due to slumping rather than actual shrinkage.

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Carbonaceous materials for the production of aluminium — Cold and tepid ramming pastes — Expansion/shrinkage during baking

1 Scope

This International Standard specifies the determination of expansion/shrinkage during baking of cold and tepid ramming pastes used in the production of aluminium.

2 Normative references

The following referenced documents are indispensable for the application 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 14422, *Carbonaceous materials used in the production of aluminium — Cold-ramming pastes — Methods of sampling*

ISO 14427, *Carbonaceous materials used in the production of aluminium — Cold and tepid ramming pastes — Preparation of unbaked test specimens and determination of apparent density after compaction*

ASTM E220, *Standard Test Method for Calibration of Thermocouples by Comparison Techniques*

3 Principle

The change in height of a rammed sample of paste is measured at temperatures increasing to 950 °C, with a holding period of 3 h at the highest temperature. The shrinkage of the paste between the temperature at which the paste has become non-plastic and at 950 °C (both before and after the holding period) is determined.

4 Apparatus and materials

4.1 Device for measuring the sample length, accurate to $\pm 0,1$ mm.

4.2 Push-rod dilatometer, capable of determining changes in length of the specimen of $2 \times 10^{-5} l_0$ (i.e. 1 μm for 50 mm length).

The contact force of the extensometer shall not exceed 2 N. The expansion/shrinkage shall be measured vertically. An example of a vertical dilatometer is given in Figure 1. The dilatometer should preferably consist of a push rod and an outer tube made of the same material. Vitreous silica is recommended as the material for the push rod and the outer tube. The gap between the outer tube and the sample shall not be less than 2 mm and not larger than 10 mm. If the sample-holding assembly is made of vitreous silica, see the precautions given in 6.2.

No irreversible changes should occur in the material in the temperature range 20 °C to 950 °C.