
International Standard



4534

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Vitreous and porcelain enamels — Determination of fluidity behaviour — Fusion flow test

Émaux vitrifiés — Détermination du comportement de fluidité — Essai d'écoulement

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4534 was developed by Technical Committee ISO/TC 107, *Metallic and other non-organic coatings*, and was circulated to the member bodies in December 1978.

It has been approved by the member bodies of the following countries :

Australia	Israel	Romania
Czechoslovakia	Italy	South Africa, Rep. of
Germany, F.R.	Japan	Switzerland
Hungary	Netherlands	Turkey
India	Poland	USA

The member bodies of the following countries expressed disapproval of the document on technical grounds :

France
United Kingdom

Vitreous and porcelain enamels — Determination of fluidity behaviour — Fusion flow test

0 Introduction

The fusion flow test described in this International Standard is a comparative method which can be carried out with simplified equipment to provide data on the fluidity behaviour of molten enamel. The results from this test allow conclusions on the flow properties of the enamel to be inferred in a much simpler manner than is possible from the results of the much more expensive measurements made using the usual viscosity measuring instruments.

The results of extensive tests¹⁾ have shown that there is a well defined relationship between the results of the flow test and the viscosity-temperature curve, so that the flow test could also be used as an absolute method. However, more effort would be required to enable the various laboratories to obtain comparable results of similar quality than when using the method for comparative purposes.

When using this method, the reference (comparison) enamel must be similar to the enamel to be tested, as the fluidity behaviour of the various types of enamel may vary considerably from one type to another.

1 Scope and field of application

This International Standard specifies a comparative method of determining the fluidity behaviour of vitreous and porcelain enamels in the viscous condition during firing. It is not intended for use as an absolute method.

It is applicable to molten enamels, but not to sintered ground coat enamels.

2 Principle

Dry or wet grinding of test samples in accordance with the processing conditions. Pressing of cylindrical specimens of specified weight from the enamel powder, or the dried enamel slip, and from the agreed reference enamel.

Placing of the specimens in a laboratory oven at an agreed temperature on an unglazed ceramic tile in the horizontal position and melting to hemispherical shape. Tilting of the tile to permit the enamel to flow at an angle of 45° for an agreed period.

Calculation of the length flow number, F_l , and the breadth flow number, F_b , on the basis of the flow lengths and flow breadths of the specimens.

3 Material and apparatus

3.1 Reference enamel, to be agreed upon, having similar fluidity behaviour to the enamel to be tested.

3.2 Ball mill.

3.3 Evaporating device, for example a hot-air oven, a hot plate, or sand bath.

3.4 Mortar.

3.5 Pestle.

3.6 Balance, accurate to 0,01 g.

3.7 Press, giving a pressure of at least 5 N/mm² (5 MPa), and a **mould** having an internal diameter of 8 mm for preparation of the test specimens.

3.8 Flow plate, consisting of a square smooth unglazed ceramic tile, of side 75 mm, 5 to 6 mm thick and pre-fired at a temperature of at least 1 100 °C. It shall have a water absorption at atmospheric pressure of not more than 25 % and a homogeneous fine ceramic body. Flow plates may also be cut from a larger plate (see clause A.1).

1) Dekker, P. : Calculation of viscosity-temperature curves for porcelain enamels from the flow-button test. *Journal of the American Ceramic Society* **48** (1965), 6, pp. 319 to 327.