Designation: C 1276 – 94 (Reapproved 2005)

Standard Test Method for Measuring the Viscosity of Mold Powders Above Their Melting Point Using a Rotational Viscometer[1]

This standard is issued under the fixed designation C 1276; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers measurement of the viscosity of mold powders above their melting point through the use of a platinum spindle immersed in a platinum crucible containing the molten mold flux. Developed by differential angular velocity between the crucible and spindle, spindle torque is measured and used to calculate the viscosity. Data are generally taken as a function of temperature to describe the viscosity-temperature relationship for the molten mold flux.

1.2 This test method uses a high-temperature furnace and measurements on molten material. Personal protection equipment to wear include high-temperature resistant insulating gloves, coveralls, and a full-face shield.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* A specific warning statement is given in Note 1.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

C 965 Practice for Measuring of Viscosity of Glass Above the Softening Point

C 1095 Practice for Calculating Precision Data on Refractories (C08) from Interlaboratory Test Results[3]

E 220 Test Method for Calibration of Thermocouples by Comparison Techniques

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Significance and Use

3.1 The viscosity of a molten mold flux is a very important property for the correct functioning of a mold powder. This procedure is designed for producers and users of mold powders to develop the viscosity-temperature relationships of the molten mold flux for quality control or specification purposes, or both. Practice C 965 was developed for glasses that are significantly higher in viscosity than mold powders. Also, sample preparation is very different for the glass products covered.

NOTE 1—**Warning:** Use caution when discharging molten sample into water since this can cause an explosion.

4. Apparatus

4.1 *Electrically Heated Furnace*, equipped with a temperature controller, temperature measuring equipment, a spindle, a crucible, a device to rotate the spindle, and equipment to measure the torque or viscosity.

4.1.1 Any electrically heated furnace capable of providing a uniform and stable temperature in the testing zone of the furnace can be used. The furnace must be capable of maintaining a temperature 180°F (82°C) above the maximum test temperature. The atmosphere in the furnace should be air or oxidizing.

4.2 *Thermocouple*, calibrated in accordance with Test Method E 220. It is preferred that the thermocouple be immersed in the molten mold flux, in which case only the bare metal of the thermocouple should be immersed, since immersion of the thermocouple sheath may result in a reaction between the sheath and the molten flux. Alternatively, the thermocouple can be placed outside the crucible containing the molten mold flux, providing that the temperature difference between the flux and the position where the thermocouple is placed is no more than 9°F (5°C).

4.3 *Spindle and Crucible*, platinum or a platinum alloy.[4] The spindle is attached to the rotating device using platinum extension wires inside the furnace and other suitable wires outside the furnace, for example, stainless steel.

4.3.1 The dimensions of the crucible and spindle shall be such that, when the crucible is filled with molten mold flux, the

[1] This test method is under the jurisdiction of ASTM Committee C08 on Refractories and is the direct responsibility of Subcommittee C08.10 on Refractories for Glass.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Withdrawn.

[4] An alloy such as zirconia grain-stabilized (ZGS) platinum has been used successfully.

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