



Standard Test Method for Alkali Resistance of Porcelain Enamels¹

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INTRODUCTION

Although all porcelain enamels are highly resistant to attack by cold alkaline solutions, some compositions are affected by hot solutions of the type encountered in automatic laundry and dishwashing equipment. Tests to eliminate porcelain enamels of poor resistance have been developed and used by various laboratories. In general, these tests consist of subjecting specimens to a boiling solution of either sodium pyrophosphate or sodium hydroxide for a period of two or more hours. The specimens are weighed before and after exposure to the test treatment and the loss-in-weight is taken as a measure of alkali attack. In some tests representing milder exposure conditions, the 45 degree specular gloss is measured before and after exposure and the percentage of initial gloss retained is used as an indicator of alkali resistance. While such tests have served a useful purpose in developing more resistant porcelain enamel compositions and in manufacturing control operations, agreement between laboratories has left something to be desired. The present test was designed to provide the reproducibility between laboratories that is so essential to any standard test procedure.

1. Scope

1.1 This test method² covers the measurement of the resistance of a porcelain enamel to a hot solution of tetrasodium pyrophosphate. Although the specific alkali mentioned herein is tetrasodium pyrophosphate the equipment and techniques are equally applicable to other alkali solutions.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *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.*

2. Significance and Use

2.1 This test method is intended specifically for testing the resistance to alkaline attack of porcelain enamels to be used as

a final finish on washing machines, dishwashers, combination washer-dryers, and similar appliances where the surface is normally exposed to an alkaline environment at elevated temperatures.

3. Apparatus

3.1 *Test Chamber*, of a type illustrated in Fig. 1, Fig. 3, and Fig. 6. This part of the equipment consists of a stainless steel beaker fitted with an O-ring sealed cover which supports an immersion heater, a stirring device, thermometer and thermistor wells; three specimen holders; a reflux condenser; a flow channeling shield to slide over and be supported by the immersion heater; and a stirring motor.³ The beaker, heater sheath, stirring device, thermometer and thermistor wells, specimen holders, and the flow channeling shield shall be made from stainless steel alloys from the AISI 300 Series.

3.2 *Temperature Controller*, thermistor-actuated, capable of maintaining the temperature of the alkali solution in the beaker at $96.00 \pm 0.20^\circ\text{C}$.

3.3 *Thermometer*, calibrated, approximately 15 in. (380 mm) long and $9/32$ in. (7.1 mm) in diameter, with 0.1° divisions.

3.4 *Drying Oven*, electrically heated.

3.5 *Balance*, having a sensitivity of 0.1 mg and a capacity of not less than 200 g.

¹ This test method is under the jurisdiction of ASTM Committee B08 on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee B08.12 on Materials for Porcelain Enamel and Ceramic-Metal Systems.

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² This test was developed at the National Bureau of Standards under the sponsorship of The Porcelain Enamel Institute, Inc., and published as P. E. I. Bulletin T-25.

³ See the appendix for drawings of the equipment. This equipment may be purchased from the Hoover Instrument Service, Inc., 401 N. Home Rd., Mansfield, OH 44906.