

Australian Standard<sup>®</sup>

---

**METHODS OF TEST FOR  
VITREOUS ENAMEL COATINGS**

**PART 1.5: CHEMICAL TESTS—  
DETERMINATION OF RESISTANCE  
OF VITREOUS ENAMEL COATINGS  
TO CITRIC ACID AT ROOM  
TEMPERATURE**

---

The following scientific, industrial and governmental organizations and departments were officially represented on the committee entrusted with the preparation of these standard methods:

Australian Electrical Manufacturers Association

Australian Gas Association

Australian Vitreous Enamellers Institute

Bureau of Steel Manufacturers of Australia

Confederation of Australian Industry

Department of Science

Electricity Supply Association of Australia

Gas Appliance Manufacturers Association of Australia

Health Commission of N.S.W.

Metal Trades Industry Association of Australia

Australian Standard<sup>®</sup>

---

**METHODS OF TEST FOR  
VITREOUS ENAMEL COATINGS**

**PART 1.5: CHEMICAL TESTS—  
DETERMINATION OF RESISTANCE  
OF VITREOUS ENAMEL COATINGS  
TO CITRIC ACID AT ROOM  
TEMPERATURE**

---

**AS 2219**  
**December 1978**

## PREFACE

These standard methods were prepared by the Association's Committee on Vitreous Enamel Finishes as the revision, metrication and extension of the methods in AS K95—1961 which they accordingly supersede.

During its work on these standard methods, the committee took particular note of ISO/TC 107/SC 7 published documents and standards, and accordingly has introduced test methods and equipment which have been adopted as international standards. These include:

ISO 2722	Vitreous and Porcelain Enamels— Determination of Resistance to Citric Acid at Room Temperature
ISO 2723	Vitreous and Porcelain Enamels for Sheet Steel— Production of Specimens for Testing
ISO 2724	Vitreous and Porcelain Enamels for Cast Iron— Production of Specimens for Testing
ISO 2733	Vitreous and Porcelain Enamels— Apparatus for Testing with Acid and Neutral Liquids and their Vapours
ISO 2734	Vitreous and Porcelain Enamels— Apparatus for Testing with Alkaline Liquids
ISO 2742	Vitreous and Porcelain Enamels— Determination of Resistance to Boiling Citric Acid
ISO 2743	Vitreous and Porcelain Enamels— Determination of Resistance to Boiling Hydrochloric Acid
ISO 2744	Vitreous and Porcelain Enamels— Determination of Resistance to Boiling Water and Water Vapour
ISO 2745	Vitreous and Porcelain Enamels— Determination of Resistance to Hot Sodium Hydroxide
ISO 2746	Vitreous and Porcelain Enamels— Enamelled Articles for Service under Highly Corrosive Conditions —High Voltage Test

International tests for the determination of abrasion resistance have not yet been finalized; accordingly, this standard relies on the test developed by the Porcelain Enamel Institute in America as specified in ASTM C448 —1964.

The introduction of continuous cleaning enamels on the commercial market has necessitated the inclusion of a test method to test their efficacy.

These standard methods may require reference to the following standards:

AS 1580	Methods of Test for Paints, Varnishes, Lacquers and Related Materials (Metric Units)— Method 602.2, Specular Gloss
AS 1914	Glossary of Terms Relating to Vitreous Enamel Coatings
BS 1041	Code for Temperature Measurement

LIST OF METHODS

Number	Title
<b>PART 1—CHEMICAL TESTS</b>	
AS 2219.1.1—1978	Determination of resistance of vitreous enamel coatings to hot sodium hydroxide
AS 2219.1.2—1978	Determination of resistance of vitreous enamel coatings to boiling water and water vapour
AS 2219.1.3—1978	Determination of resistance of vitreous enamel coatings to boiling hydrochloric acid
AS 2219.1.4—1978	Determination of resistance of vitreous enamel coatings to boiling citric acid
AS 2219.1.5—1978	Determination of resistance of vitreous enamel coatings to citric acid at room temperature
<b>PART 2—PHYSICAL TESTS</b>	
AS 2219.2.1—1978	Determination of resistance of vitreous enamel coatings on steel to thermal shock
AS 2219.2.2—1978	Determination of the heat resistance of vitreous enamel coatings on cast iron
AS 2219.2.3—1978	Determination of abrasion resistance of vitreous enamel coatings
<b>PART 3—MISCELLANEOUS TESTS</b>	
AS 2219.3.1—1978	Determination of the performance of continuous cleaning vitreous enamel coatings

## STANDARDS ASSOCIATION OF AUSTRALIA

## Australian Standard

## METHODS OF TEST FOR VITREOUS ENAMEL COATINGS

## PART 1—CHEMICAL TESTS

## AS 2219.1.5

DETERMINATION OF RESISTANCE OF VITREOUS  
ENAMEL COATINGS TO CITRIC ACID AT ROOM TEMPERATURE

**1 SCOPE.** This standard describes the procedure for determining the resistance of vitreous and porcelain enamels to citric acid at room temperature.

NOTE: The method is not suitable for matt enamels or enamels that come into contact with hot strong acids or enamelled items used in the chemical industry.

**2 PRINCIPLE.** Enamelled test pieces are exposed to attack by a solution of citric acid at room temperature. The surface appearance is then visually assessed and classified according to a pencil test and/or a reflection test.

**3 DEFINITIONS.** For the purpose of this standard, the following definitions apply:

*Test sample*—a portion of material or a group of items selected from a batch or consignment by a sampling procedure.

*Test specimen*—a portion of material or a single item taken from the sample for the purpose of applying a particular test.

*Test panel*—a panel prepared for testing and made from a test specimen by some mechanical operation.

**4 REAGENTS.** Chemicals used for testing purposes shall be free from impurities which could influence the outcome of the test. The following reagents are required:

(a) *Citric acid*, 100 g/L solution of AR citric acid ( $C_6H_8O_7 \cdot H_2O$ ).

NOTE: A fresh solution, prepared the same day, is required for each test.

(b) *Distilled or demineralized water*.

(c) *Solvent cleaner*, such as trichloroethylene or acetone.

**5 APPARATUS.** The following apparatus is required:

(a) Graduated measuring cylinder (100 mL).