
International Standard 4794

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Laboratory glassware — Methods for assessing the chemical resistance of enamels used for colour coding and colour marking

Verrerie de laboratoire — Méthodes d'évaluation de la résistance chimique des émaux utilisés pour le code de couleurs et les couleurs d'identification

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Foreword

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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 4794 was developed by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus*, and was circulated to the member bodies in June 1979.

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

Australia	India	Romania
Czechoslovakia	Israel	South Africa, Rep. of
Egypt, Arab Rep. of	Italy	Spain
France	Korea, Rep. of	United Kingdom
Germany, F. R.	Mexico	USA
Hungary	Poland	USSR

No member body expressed disapproval of the document.

Laboratory glassware — Methods for assessing the chemical resistance of enamels used for colour coding and colour marking

0 Introduction

The following methods of test are intended to give an assessment of the chemical resistance of colour marking enamels used on laboratory glassware, e.g. pipettes colour coded according to ISO 1769. Detergent and acid solutions have been chosen to represent the most severe conditions to be encountered in practice.

A proposal to include a test for resistance to autoclaving was considered, but was rejected as unnecessary on the grounds that the test for resistance to detergent solutions would cover the same ground.

Consideration was also given to a test involving immersion in a chromic/sulphuric acid solution, but this was thought to be unnecessary because of the decreasing use of these solutions for cleaning laboratory glassware, the difficulty in specifying such a solution precisely, and evidence that the degree of attack on colour coding enamels would be no greater than with the hydrochloric acid solution specified in this International Standard.

1 Scope and field of application

This International Standard specifies test methods for the assessment of the service performance of enamels used for colour coding and colour marking of laboratory glassware. It does not purport to classify enamels by their degree of resistance; it provides standard procedures for determining whether an enamel resists the specified treatment without a change such that the colour can no longer be identified, or might be confused with any other colour used in colour coding.

The procedures involve treatment for specified periods with an alkaline detergent solution at 80 °C and a dilute acid solution at room temperature.

2 Reference

ISO 1769, *Laboratory glassware — Pipettes — Colour coding*.

ISO 3819, *Laboratory glassware — Beakers*.¹⁾

3 Reagents

3.1 Distilled water or deionized water.

3.2 Detergent solution.

Dissolve 50 g of tetrasodium pyrophosphate ($\text{Na}_4\text{P}_2\text{O}_7$) and 5 g of sodium dodecylbenzene sulphonate ($\text{C}_{18}\text{H}_{29}\text{SO}_3\text{Na}$) in 1 litre of water.

3.3 Hydrochloric acid [$c(\text{HCl}) = 2 \text{ mol/l}$], analytical grade.

3.4 Acetone (CH_3COCH_3), pure.

4 Apparatus

4.1 Beaker, of capacity 1 litre, complying with ISO 3819.

4.2 Beaker cover glass, of diameter sufficient to cover the 1 litre beaker (4.1).

4.3 Heating bath, with suitable heating equipment which enables a test solution to be maintained at a constant temperature of $80 \pm 1 \text{ }^\circ\text{C}$.

4.4 Sample holder, made from inert material.

4.5 Stoppered storage vessels.

4.6 Thermometer, suitable for use in the heating bath (4.3) and capable of measuring to $\pm 1 \text{ }^\circ\text{C}$ at a temperature up to 100 °C.

4.7 Cleaning cloth, made of pure cellulose.

1) At present at the stage of draft.

5 Preparation of test pieces

Cut test pieces from the laboratory glassware so as to include the complete colour marking enamel to be assessed plus at least 5 mm of the adjacent parts of the glassware. Wash each test piece three times in separate portions of the cold water (3.1), and wipe with the cleaning cloth (4.7), then wash three times in separate portions of the cold acetone (3.4). Finally, wipe the test pieces with the cleaning cloth to remove all traces of soiling, and transfer them to a stoppered storage vessel (4.5), unless proceeding immediately with testing.

6 Procedures

6.1 Resistance to detergent solutions

Heat 700 ml of the detergent solution (3.2) to 80 ± 1 °C in the beaker (4.1) using the heating bath (4.3). Suspend not more than 10 test pieces, with the aid of the sample holder (4.4), in the hot test solution, so that the test pieces are freely in contact with the solution on all sides. Cover the beaker with the beaker cover glass (4.2).

Maintain the temperature of the test solution at 80 ± 1 °C for 120 ± 5 min from the time of immersion.

After this period, remove the test pieces from the solution, wash them thoroughly with the water (3.1), wipe with the cleaning cloth (4.7) and then rinse three times in fresh portions of the acetone (3.4). Allow to drain dry.

6.2 Resistance to acid solutions

Transfer about 700 ml of the cold hydrochloric acid (3.3) to the clean beaker (4.1) and allow to stand until it reaches room temperature 23 ± 3 °C.

Suspend not more than 10 test pieces, with the aid of the sample holder (4.4), in the hydrochloric acid so that the test pieces are freely in contact with the acid on all sides, and cover with the beaker cover glass (4.2). Allow to stand for 60 ± 5 min at room temperature.

After this period, remove the test pieces from the acid, wash them thoroughly with water (3.1), wipe with the cleaning cloth (4.7) and then rinse three times in fresh portions of acetone (3.4). Allow to drain dry.

7 Interpretation of results

7.1 Examination of test pieces

At the end of each test, compare the colour of the enamel on each of the treated pieces with that on a similar test piece

which has been prepared in accordance with clause 5 and then stored without further treatment. Disregard any loss of gloss in the treated test pieces, but note any change or loss of colour such as might lead to the loss of colour marking or to confusion with any other colour used in colour coding.

7.2 Resistance to detergent solutions

A colour coding enamel, when prepared in accordance with clause 5 and tested as specified in 6.1, is regarded as passing the test, if it does not change in colour, with or without loss of gloss, to the extent that its identity is lost or that it can be confused with any other colour used for colour coding.

7.3 Resistance to acid solutions

A colour coding enamel, when prepared in accordance with clause 5 and tested as specified in 6.2, is regarded as passing the test if it does not change in colour, with or without loss of gloss, to the extent that its identity is lost or that it can be confused with any other colour used for colour coding.

7.4 Conditions for re-test

If in either test for the resistance to detergent solutions or the test for resistance to acid solutions, any of the test pieces has changed colour to an unacceptable extent, that test shall be repeated with a fresh sample piece of the colour which failed. No failures on re-test are permitted.

8 Test report

The following minimum information shall be given in the test report :

- a) size and description of the batch or consignment of laboratory glassware from which the sample was taken;
- b) colour of the enamels tested;
- c) number of test pieces used;
- d) results of test for resistance to detergent solutions and of test for resistance to acid solutions;
- e) whether re-test was necessary in test for resistance to detergent solutions or in test for resistance to acid solutions;
- f) date of test.