

# IPC-TM-650 TEST METHODS MANUAL

Number 2.3.43.4	
Subject Spotting to Alkali for E-Textiles	
Date 02/2025	Revision
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Originating Task Group: E-Textiles Exposure and Durability Test Methods Task Group	

## 1 SCOPE

This test method is used for determining the change of one or more functionally relevant parameters in e-textiles as a result of exposure to dilute solutions of organic and mineral alkali.

**1.1 Principles of Test** The e-textile is (repeatedly) exposed to different alkaline solutions while observing a change of one or more relevant functional parameters after the exposure.

### 1.2 Terms and Definitions

**1.2.1 Critical Area** The areas of e-textiles that have a higher tendency of failure compared to other areas (e.g., joints, connection points, textile electrodes) or that if affected will negatively impact product functionality or the product capability to operate as intended.

**1.2.2 Data Recorder** A measuring device used to record electrical resistance or electrical continuity.

## 2 APPLICABLE DOCUMENTS

### 2.1 International Organization for Standardization (ISO)<sup>1</sup>

**ISO 139** Textiles — Standard atmospheres for conditioning and testing.

## 3 SPECIMENS

### 3.1 Specimen Preconditioning

All test specimens **shall** be conditioned for  $\geq 24$  hours according to ISO 139. If other conditions are specified, they should be reported with the test results.

### 3.2 Specimen Description

If the testing equipment is large enough, the entire e-textile **shall** be tested. Otherwise, cut specimens containing at least one type of critical area from the e-textile to a size that fits the testing equipment.

### 3.3 Number of Specimens

The number of test specimens **shall** be defined to respect the statistical treatment (at least five, if the e-textile is cut into smaller specimens: at least five per affected critical area).

## 4 APPARATUS AND MATERIAL

**4.1** Pipette or dropper

**4.2** Glass rod, with a rounded end

**4.3** Protective equipment

<sup>1</sup> www.iso.org

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4.4 Flat-bottom glass dish large enough to contain specimen

4.5 One or more of the following alkalis, as specified:

- Sodium carbonate solution, containing 100g of anhydrous sodium carbonate  $\text{Na}_2\text{CO}_3$  per L of water
- Calcium hydroxide paste, containing 1 g of calcium hydroxide  $\text{Ca}(\text{OH})_2$ , mixed with 1g to 2g of water
- Ammonium hydroxide, a solution containing 28% of ammonium hydroxide  $\text{NH}_4\text{OH}$  and water

4.6 Grade 3 water

4.7 Data recorder for functionality testing

## 5 PROCEDURES

5.1 Using the data recorder, measure the initial value of the relevant functional parameter(s). Conduct a visual inspection of the specimen prior to testing.

5.2 Select alkali (see Table 1):

**Table 1 pH Levels of Alkali Solutions**

Alkali	pH Range
Sodium carbonate	11.5 to 11.7
Calcium hydroxide	12.3 to 12.5
Ammonium hydroxide	13.5 to 13.7

### 5.3 Sodium Carbonate

5.3.1 Place the specimen in a clean, dry, flat-bottomed dish. Using dropper and glass rod to spread the alkali, apply enough alkali to cover the critical area. This **shall** be conducted at room temperature.

5.3.2 Place the specimen on a flat surface and allow it to completely dry at room temperature for at least six hours. Brush it to remove the sodium carbonate residues.

5.3.3 If brushing is not enough to completely remove the whitish ring caused by spotting with sodium carbonate, rinse the specimen in a glass beaker for 60 seconds with 100 mL of Grade 3 water and allow it to completely dry at room temperature for at least six hours.

5.3.4 Visually assess the wet area after 10 minutes for no signs of white residue. Repeat rinsing if necessary

### 5.4 Calcium Hydroxide

5.4.1 Spread calcium hydroxide paste to cover the critical area of the specimen. This **shall** be done at room temperature.

5.4.2 Place the specimen on a flat surface and allow it to completely dry at room temperature for at least six hours. Brush it to remove the calcium hydroxide residues.

5.4.3 If brushing is not enough to completely remove the whitish ring caused by spotting with calcium hydroxide, rinse the specimen in a glass beaker for 60 seconds with 100 mL of Grade 3 water and allow to dry at room temperature.

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**5.4.4** Visually assess the wet area after 10 minutes for no signs of white residue. Repeat rinsing if necessary

#### **5.5 Ammonium Hydroxide**

**5.5.1** Steep the specimen in the glass dish filled with the fresh ammonium hydroxide solution for two minutes. This **shall** be conducted at room temperature

**5.5.2** Place the specimen on a flat surface and allow it to dry at room temperature without rinsing.

**5.6** Evaluate the functionality of the specimen.

**5.7** If required, repeat process up to 5 times.

#### **6 TEST REPORT**

The test report **shall** include the following information:

- Date and time of test
- Testing location and name of tester
- Environmental test conditions (if differing from ISO 139)
- Number of test specimens
- Description of test specimens (if smaller specimen are cut from the e-textile, include size, cutting direction (warp/weft (wovens), course/wale (knits)), type of critical area, location of critical area within specimen, etc.)
- Description/Specifications of testing equipment
- Testing parameters/specifications (type of alakali(s) used, test length, number of repetitions, other info)
- Test results (parameter values before and after testing)
- Results of visual inspection before and after testing
- Any deviations from the presented methods
- Comments

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