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Subject Spotting to Acid for E-Textiles	
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Originating Task Group: D-74b E-Textiles Exposure and Durability Test Methods Task Group	

IPC-TM-650
TEST METHODS MANUAL

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 acids.

1.1 Principles of Test The e-textile is (repeatedly) exposed to different acidic 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 ability for the product 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)[1]

ISO 139 Textiles — Standard atmospheres for conditioning and testing.

3 SPECIMENS

3.1 Specimen Preconditioning

All test specimens **shall** be conditioned for ≥ 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

1 www.iso.org

4.4 Flat-bottom glass dish large enough to contain specimen

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

- Acetic acid solution, containing 300 g of glacial acetic acid (CH_3COOH) per L of water.
- Sulfuric acid solution, containing 50 g of concentrated sulfuric acid (H_2SO_4) (1.84 g/mL) per L of water
- Tartaric acid solution, containing 100 g of crystalline tartaric acid ($HO_2CCHOHCHOHCO_2H$) per L of water (especially for acetate fibers)
- Hydrochloric acid solution, containing 350 g of concentrated hydrochloric acid (HCl) per L of 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 acid (see Table 1).

Table 1 pH Levels of Acid

Acid Solution	pH Range
Acetic acid	1.8 to 2.4
Tartaric acid	1.5 to 1.8
Sulfuric acid	0.6 to 0.8
Hydrochloric acid	0.1 to 0.3

5.3 Place the specimen in a clean, dry, flat-bottom glass dish. Using dropper and glass rod to spread the acid, apply enough acid to cover the critical area. This **shall** be conducted at room temperature. Acid **shall** be as specified.

5.4 Visually assess the wet area after 10 minutes.

5.5 Place the specimen on a flat surface and allow it to completely dry at room temperature for at least six hours.

5.6 Evaluate the functionality using the data recorder.

5.7 Repeat process for all other acids as specified.

5.8 If required repeat process up to five 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 acid(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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