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# Chlorine, Retained, Tensile Loss: Single Sample Method

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## 1. Purpose and Scope

1.1 This is an accelerated test method to determine the potential damage caused by retained chlorine. It has been designed for use on cotton and rayon fabrics, but may be used on any fabric or finish that is not damaged by heat alone (see 11.1).

## 2. Principle

2.1 The fabrics are treated in sodium hypochlorite solution, rinsed, dried and pressed between hot metal plates. The damaging action of the retained chlorine is calculated from the difference in tensile strength before and after pressing.

## 3. Terminology

3.1 **retained chlorine**, *n.*—*in textiles bleached with chlorine-type bleaches*, available chlorine which remains in the material after washing and drying.

## 4. Safety Precautions

NOTE: These safety precautions are for information purposes only. The precautions are ancillary to the testing procedures and are not intended to be all inclusive. It is the user's responsibility to use safe and proper techniques in handling materials in this test method. Manufacturers MUST be consulted for specific details such as material safety data sheets and other manufacturer's recommendations. All OSHA standards and rules must also be consulted and followed.

4.1 Good laboratory practice should be followed. Wear safety glasses in all laboratory areas.

4.2 Manufacturer's safety recommendations should be followed when operating laboratory testing equipment.

4.3 All chemicals should be handled with care. Use chemical goggles or face shield, impervious gloves and an impervious apron when handling sodium carbonate and sodium hypochlorite bleach solutions; these are corrosive chemicals.

4.4 An eyewash/safety shower should be located nearby and a self-contained breathing apparatus should be readily available for emergency use.

4.5 Exposure to chemicals used in this procedure must be controlled at or below levels set by governmental authorities (e.g., Occupational Safety and Health Administration's [OSHA] permissible exposure limits [PEL] as found in 29 CFR 1910.1000; see web site: [www.osha.gov](http://www.osha.gov) for latest version). In addition, the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) comprised of time weighted averages (TLV-TWA), short term exposure limits (TLV-STEL) and ceiling limits (TLV-C) are recommended as a general guide for air contaminant exposure which should be met (see 11.2).

## 5. Apparatus and Reagents (see 11.3)

5.1 Beakers, 800 mL.

5.2 pH meter (see 11.4).

5.3 Constant temperature bath (or suitable alternative means of controlling temperatures).

5.4 Wringer, laboratory or household type.

5.5 Heating device, providing even heat transfer to the specimen from the top by close contact at a controlled temperature and giving a pressure on the specimen of 8.8 g/cm<sup>2</sup> (see Fig. 1 and 11.5).

5.6 Tensile-strength tester.

5.7 Sodium hypochlorite stock solution having an available chlorine content of approximately 5.0%.

5.8 Water, distilled.

## 6. Preparation of Sample

6.1 Normally, only warpwise speci-

mens are tested. Cut the sample approximately 35.6 cm (14 in.) in the warpwise direction and 20.3 cm (8 in.) in the fillingwise direction (if testing filling specimens, reverse these figures).

## 7. Preparation of Solutions

7.1 Prewetting and Rinse Solutions. Determine the pH of the distilled water; if outside the range of 6-7, report the actual pH with the final results of test (see 11.6).

7.2 Chlorination Solution. Prepare a chlorination solution containing 0.25% available chlorine at a pH of 9.5 ± 0.1 as follows:

7.2.1 Determine the percent available chlorine (Cl) of the sodium hypochlorite stock solution (see 11.7).

7.2.2 Calculate the number of grams (g) of stock solution required to make one liter of a 0.25% available chlorine solution as follows:

$$g = (1000 \times 0.25) / Cl$$

where:

g = grams of stock solution required.

Cl = % available chlorine determined.

7.2.3 To 900 mL of distilled water add the calculated grams (g) of stock solution required. Adjust the pH to 9.5 ± 0.1 by the addition of either sodium bicarbonate to lower the pH or sodium carbonate to raise it. Finally, add distilled water to make 1 L and recheck the pH.

## 8. Procedure

8.1 Because many factors, such as pH, concentration and time, significantly in-



Fig. 1—Heating device.