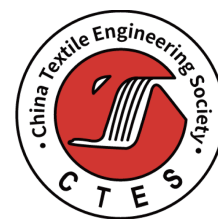




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### **Textile Bioengineering and Informatics Society (TBIS)**

Address: Market Square, Sandbach, Cheshire, England, CW11 1AT, UK

Email: [admin@tbisociety.org](mailto:admin@tbisociety.org)

Website: [www.tbisociety.org](http://www.tbisociety.org)

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# Antivirus and Antibacterial Finishing Agents for Textiles and Their Functional Evaluation

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## 1 Scope

This document specifies the terms, definitions, technical requirements, ecological safety, hygienic safety, test methods, inspection rules, marks, labels, packaging, storage and transportation of anti-virus and anti-bacterial liquid finishing agents for textiles.

This document is applicable to liquid anti-virus and anti-bacterial finishing agents for textiles, and antiviral additives for spinning reference implementation.

## 2 Normative References

The contents of the following documents, by normative reference in the text, constitute indispensable provisions of this document. For a reference document marked with a date, only the version corresponding to the date is applicable to this document; For undated references, the latest version (including all amendments) applies to this document.

GB/T 4472-2011 Determination of density and relative density for chemical products.

GB/T 20708-2019 Limit and determination of parts of harmful substances in textile dyeing and finishing auxiliaries.

GB/T 20944.3-2008 Textiles-Evaluation for antibacterial activity-Part 3:Shake flask method.

GB/T 22235-2008 Determination for viscosity of liquids

GB/T 25812-2010 Standard bleached cotton fabric used for dyeing test.

GB/T 38496 - 2020 Toxicological procedures and methods of safety evaluation for disinfectant.

FZ/T 73023-2006 Antibacterial knitwear

HG/T 4164-2010 Textile dyeing and finishing auxiliaries-Determination of pH value.

HG/T 4266-2011 Determination of solid content of textile dyeing and finishing auxiliaries.

HG/T 4267-2011 Textile dyeing and finishing auxiliaries-Determination of ionicity.

ISO 18184-2025 Textiles-Determination of antiviral activity of textile products.

### 3 Terms and Definitions

The following terms and definitions apply to this document.

#### 3.1 Antiviral

The ability to inactivate viruses through physical or chemical effects.

#### 3.2 Antibacterial

The ability to inhibit the reproduction of bacteria and fungi through physical or chemical effects.

#### 3.3 Antivirus and Antibacterial Finishing Agent

An agent that can inactivate viruses and inhibit the reproduction of bacteria and fungi.

#### 3.4 Antiviral Activity Rate

The percentage reduction of viral titer in the antiviral test.

### 4 Technical Requirement

#### 4.1 Requirements for Generality

The reference physical indexes used to assess the universal application of antivirus and antibacterial finishing agents for textiles are shown in Table 1.

Table 1: Reference physical indexes for assessing the universal application of antiviral and antibacterial finishing agents.

Item	Reference Physical Index	
Appearance		() Liquid
Ionic		Cationic, anionic, non-ionic
pH Value (1% aqueous solution)	The specific value and product ionicity in the right () are to be marked by the manufacturer.	() Deviation $\pm 1$
Solids content/%		() Deviation $\pm 2\%$
Viscosity (25 °)C/CPS		() Discrepancy $\pm 3\%$
Density (20 °)C/G/cm <sup>3</sup>		() Discrepancy $\pm 3\%$
Textile finish baking temperature/°C		() Discrepancy $\pm 3$
Compatibility	Pre-test should be carried out before using	

## 4.2 Antiviral and Antibacterial Functional Requirements

The requirements for antiviral and antibacterial functions are shown in Table 2.

Table 2: Requirements for antiviral and antibacterial functionality.

Item	Requirement	Remark
Additive dosage in textile finishing <sup>a</sup> /%(owf)	()	The specific value is to be marked by the production enterprise.
Antiviral activity rate of finished fabric/% $\geq$	99	
E. coli $\geq$	70	
Antibacterial rate of finished fabric/% Staphylococcus aureus $\geq$	70	
Candida albicans $\geq$	60	

<sup>a</sup> Abbreviation of on-weight-fabric, indicating the amount of cloth per unit weight, expressed as a percentage.

## 4.3 Ecological Safety

The ecological safety shall be implemented according to the provisions of heavy metals, APEO, or ganotin and chlorinated phenol in GB/T 20708.

## 4.4 Hygiene and Safety

### 4.4.1 Antivirus and Antibacterial Finishing Agent for Textiles

Toxicological safety is shown in Table 3.

Table 3: Toxicological safety of antiviral and antibacterial finishing agent for textiles<sup>a</sup>.

Item	Requirement	
Acute oral toxicity	No toxicity	The concentration of the test solution is prepared according to 200% of the concentration of the finishing working solution (A.3.4).
One complete skin irritation	No irritation	
Acute eye irritation	No irritation	
Vaginal mucosal irritation	No irritation	
Mammalian cell gene mutation assay in vitro	Negative	
Chromosome aberration of mammalian cells in vitro	Negative	

<sup>a</sup>For the antiviral and antibacterial finishing agent containing new important bactericidal ingredients produced or sold for the first time in China, the toxicological test shall be conducted according to 4.4 in GB/T38496-2020.

#### **4.4.2 Inhibition Zone Width**

The antibacterial substance of the textile after antibacterial finishing shall be non-dissolvable or slightly dissolvable, and the antibacterial ring width shall be  $\leq 5$  mm after the dissolvability test of the antibacterial substance.

## **5 Test method**

### **5.1 General Requirements**

#### **5.1.1 Appearance**

Take 50 mL of the sample, pour it into a 150 mL clean beaker and conduct visual inspection in a bright place.

#### **5.1.2 Ionicity**

As per HG/T4267.

#### **5.1.3 pH Value**

Refer to HG/T4164.

#### **5.1.4 Solids content**

As per HG/T4266.

#### **5.1.5 Viscosity**

Test in accordance with GB/T22235.

#### **5.1.6 Density**

Test in accordance with GB/T 447

### **5.2 Preparation of Antiviral and Antibacterial Finishing Fabric Samples**

Proceed as per Appendix A.

### **5.3 Antiviral Activity Ratio**

Cloth samples shall be prepared in accordance with Appendix A. The antiviral activity rate of the samples shall be tested in accordance with ISO 18184-2019 method. Influenza virus H1N1 (ATC-

CVR1469) or H3N2 (ATCCVR1679) shall be selected as the virus. The contact time between the samples and the virus shall be 2 H.

## **5.4 Bacteriostasis Ratio**

The cloth samples shall be prepared according to Appendix A. The bacteriostasis rate is tested according to GB/T20944.3-2008.

## **5.5 Ecological Safety**

Test in accordance with GB/T 20708-2019.

## **5.6 Toxicological Safety**

### **5.6.1 Acute Oral Toxicity Test**

Test in accordance with method 6.1 in GB/T 38496-2020.

### **5.6.2 Skin Irritation Test**

One complete test in accordance with method 6.3 in GB/T 38496 - 2020.

### **5.6.3 Acute Eye Irritation Test**

Test in accordance with method 6.4 in GB/T 38496 - 2020.

### **5.6.4 Vaginal Mucosa Irritation Test**

Test in accordance with method 6.5 in GB/T 38496 - 2020.

### **5.6.5 In Vitro Mammalian Cell Gene Mutation Assay**

Test in accordance with 6.8.1 of GB/T 38496 - 2020.

### **5.6.6 In Vitro Mammalian Cell Chromosome Aberration Assay**

Test in accordance with to 6.8.3 of GB/T 38496 — 2020.

## **5.7 Inhibition zone width**

Use the fabric sample prepared in accordance with Annex A for testing, and the method shall be implemented in accordance with FZ/T 73023.

## **6 Inspection Rules**

### **6.1 Ex-factory Inspection**

- 6.1.1** Each batch shall be inspected to be qualified, and an inspection report shall be issued.
- 6.1.2** The ex-factory inspection items are appearance, pH value, solid content, viscosity and density, or determined by the enterprise itself.

### **6.2 Type Inspection**

- 6.2.1** The samples for type inspection shall be taken from the products that have passed the factory inspection.
- 6.2.2** The items of type inspection are all the required items.
- 6.2.3** In case of any of the following circumstances, type inspection shall be carried out:
  - a) When the new product is identified and put into batch production;
  - b) Significant changes in raw materials, process and formula that may affect the product quality;
  - c) When the production is stopped for more than one month and resumed;
  - d) When the national quality supervision and inspection department puts forward the type inspection requirements;
  - e) Type inspection shall be conducted once every 5 years during normal production.

### **6.3 Group Batch and Sampling**

#### **6.3.1 Group Batch**

Take the products produced by one-time feeding as one inspection batch.

#### **6.3.2 Sampling**

Samples shall be randomly selected from each batch of products for inspection.

### **6.4 Decision Rule**

If one index is unqualified in the inspection results, double sampling is allowed from the batch of products to re-inspect the unqualified items. If the reinspection result shows that the index is unqualified, the batch of products shall be judged as unqualified products.

## **7 Marking, packaging, transportation and storage**

### **7.1 Marking**

The following marks shall be marked on the packaging bag or barrel:

- a) Product name;
- b) Net weight;
- c) The name of the company;
- d) Date of manufacture or batch number.

### **7.2 Packaging**

The package shall be packed in plastic barrel, and the package shall be sealed. The package specification is 25kg/barrel or customised as required.

### **7.3 Transportation**

Prevent collision and insolation during transportation.

### **7.4 Storage**

Store in a dry, ventilated and cool warehouse to prevent moisture.

### **7.5 Quality guarantee period**

The quality guarantee period shall be more than 6 months from the date of production under 7.3 and 7.4 conditions.

## **Appendix A Fabric Sample Preparation for Antiviral and Antibacterial Finishing Agent Test**

(Normative)

### **A.1 Principle**

The pretreated standard grey cloth shall be padded with the finishing liquid to ensure uniform adsorption. After drying and baking, the antiviral and antibacterial molecules in the finishing agent shall bond with the fiber molecules, thereby imparting antiviral and antibacterial functions to the fabric.

## **A.2 Equipment and materials**

### **A.2.1 Fabric Sampled**

Specifications of the fabric samples shall meet the requirements of GB/T25812. The fabric samples shall be cut into 4 pieces of 30 cm × 20 cm fabric samples. One piece shall be used for determining the pickup, one piece as a comparison sample, and two pieces for anti-virus and anti-bacterial finishing.

### **A.2.2 Equipment**

Electronic platform scale (tray balance), oven, small padder, baking and shaping machine, beaker (250 mL, 100 mL), tray, washing fastness tester.

### **A.2.3 Finishing agent**

Antiviral and antibacterial finishing agent and distilled water.

## **A.3 Operating Procedure**

### **A.3.1 Sample preparation**

Wash four pieces of cut cloth samples with water in accordance with Clause 10.1.1 of GB/T20944.3-2008 and then air dry or oven dry.

### **A.3.2 Weighing samples**

Two fabric samples used for finishing shall be respectively weighed by a balance, and their mass shall be calculated when the rolling allowance is 70%.

### **A.3.3 Make sure liquid carrying rate**

The rolling stock shall be preheated for at least half an hour, the speed adjusted to 1 meter per minute, and the roll pressure adjusted with another weighted cloth sample. Pour 200mL of distilled water into the tray, spread the cloth sample in the water for 30 seconds, properly stir to make the fabric fully soaked, and then roll the liquid. In the process of two soaking and two rolling, use the same balance to ensure that the rolling residual rate is 70% and the cloth weight difference is  $\pm 5\%$ .

### **A.3.4 Preparing a finishing solution**

Calculate the concentration (g/L) of the finishing solution required at 70% pick-up according to the finishing agent weight [%owf] required for unit cloth weight provided by the manufacturer.

Prepare 200mL of the finished solution and fully stir.

### **A.3.5 Fabric sample padding**

Pour 200 mL of finishing solution into a blank tray, spread one of the two pieces of cloth samples to be finished in the solution, and then perform the process of mangle, double dipping and double rolling to ensure that the mangle rate is 70% and the cloth weight difference is  $\pm 5\%$ . The other cloth sample shall be operated in the same way.

### **A.3.6 Drying and setting**

The padding cloth sample shall be stretched on a needle frame and put into an oven for pre-drying. Then, put into a small sample baking shaping machine to be baked for a specified time. The baking temperature and time shall be provided by the manufacturer.

### **A.3.7 Washing**

The two finished fabric samples shall be cut into six pieces of 10 cm  $\times$  10 cm fabric samples, totaling 12 pieces. 10 blocks shall be washed 10 times in accordance with 10.1.1. in GB/T20944.3 – 2008, and then air dried or oven dried. Four blocks shall be used for antiviral detection, and six blocks for antibacterial detection. The remaining 2 blocks shall be air dried or oven dried after completing once with the same method and shall be used for detecting the width of the bacteriostatic ring.