ITOFINISH STAYS FRESH 2

ITOFINISH STAYS FRESH 2 is photocatalytic treatment based on titanium dioxide that imparts odour killing and antibacterial properties to treated fibers.

PROPERTIES

- **Appearance :** Milky white emulsion
- **Main Ingredient :** Dispersion of fine particles of anatase type titanium dioxide.
- **Ionic Character :** non-ionic / anionic.
- **pH :** Ca. 7.5

APPLICATION

In Padding:

- **ITOFINISH STAYS FRESH 2 :** 25 g/l
- **Drying :** 100°C for 1 - 3 min.
- **Curing :** 150°C for 1 - 3 min

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CHARACTERISTICS

1. ITOFINISH STAYS FRESH 2 imparts odour killing, antibacterial as well as stain removal properties onto treated fabrics.
2. ITOFINISH STAYS FRESH 2 is a neutral treatment composed of aqueous dispersing elements of photocatalytic particles and a special binder.
3. ITOFINISH STAYS FRESH 2, being neutral, requires no acid or alkali in processing

DISCLAIMER

The information herein offered is based on the best of our knowledge at present. However, we are not able to guarantee these matters, as the result of application may vary according to conditions adopted. Preliminary tests are, therefore, recommended in all cases. Please refer to MSDS regarding handling of the products.

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ITOFINISH STAYS FRESH 2

APPENDIX

How to use

1) Photocatalystic elements of ITOFINISH STAYS FRESH 2 is hardly absorbed by fiber selectively. That is, the degree of water pickup of a substrate may determine the amount of photocatalystic elements taken up by the substrate. Treatment bath, therefore, should be prepared in order for a substrate to take up solution by 2.5 % in terms of the original solution of ITOFINISH STAYS FRESH 2 against weight of the substrate.

   Pickup amount of photocatalystic elements = 2.5 % in terms of the original solution of ITOFINISH STAYS FRESH 1B or 2 against weight of textile substrate to be treated.

2) In a practical case, the fabric is dipped in to a treatment bath and wrung out by a mangle. Then such wet fabric contains photocatalystic elements. For example, in case that fabric takes up 50% solution against weight of fabric, treatment liquor can be prepared by diluting the original solution with 20 parts of water so that fabric picks up 2.5 %.

   The ideal amount of photocatalystic elements picked up by substrate

   = 100 % pickup of treatment liquor (dilute solution with 40 parts of water) to weight of fabric

   = 50 % pickup of treatment liquor (dilute solution with 20 parts of water) to weight of fabric

   = 2.5 % pickup of the original solution to weight of fabric

3) It is recommended to dry fabric thoroughly before dipping in the treatment bath in order to minimize effect of other chemicals. If other chemicals are used unavoidably, compatibility should be checked beforehand, and the dosage should be minimized

4) ITOFINISH STAYS FRESH 2 is an aqueous solution that may not be absorbed by such hydrophobic fiber as wool. In this case, a penetrating agent or a de-airing agent should be added (the dosage should be as little as possible according to fabric type and its weight).

5) It is recommended to use ITOFINISH STAYS FRESH 2 when fabric substrate is deep in color..

Precautions for use

1) It is recommended to use ion-exchange water or refined water for diluting the product. When tap water or well water is used for dilution, photocatalystic elements tend to precipitate by the effect of ion contained in water. Maintain dilute solution without precipitation.

2) Stir the product thoroughly before use.

3) Dilute solution should be used up soon because it is a bit poor in stability in comparing with the original solution.

4) Antibacterial and odor killing function of photocatalyst are realized when they are in contact with bacteria and odorous elements. Therefore, please mind how to process fabric according to the fact that photocatalyst may not function well when covered by other chemicals.

5) Preliminary tests are recommended in any cases because the effect may vary depending on uses, fabric type, and processing conditions to be adopted.

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ITOFINISH STAYS FRESH 2

APPENDIX

Effect of fabric treated by ITOFINISH STAYS FRESH 2 treatment agent to formaldehyde

Test conditions

- **Specimen :** Fabric treated by Itofinish Stays Fresh (shirt: 100 % cotton)
- **Test container :** A desiccator
- **Tested by :** Japan's spinners' association
- **Test number :** 005691

Test method

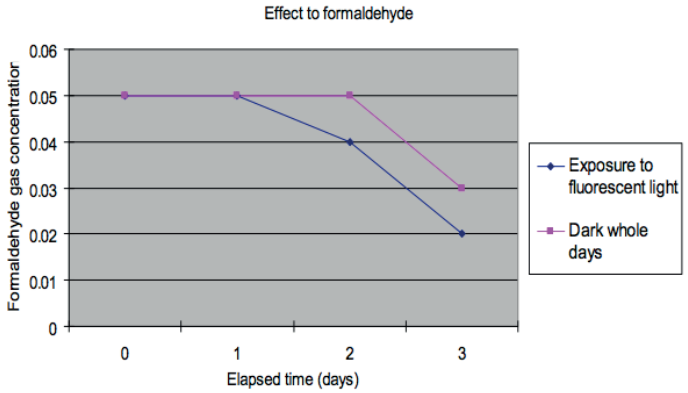
Specimens were forced to absorb formaldehyde (specimens were put and left in a desiccator filled with formaldehyde gas). A specimen was exposed to fluorescent light (but turned off the light in the nighttime), and another specimen was kept in the dark, whole days. Then the formaldehyde contents (concentration) in the specimens was measured according to the test standard No. 34 (for baby clothes) as determined by the Ministry of Health, Labor and Welfare of Japan.

Test result

The following graph shows the variation in gas concentration.

At the beginning, fabric decomposed the formaldehyde gas that was absorbed by the fabric. Then, the fabric decomposed the gas inside the fabric 3 days later.

	Initial	1 day later	2 days later	3 days later
Exposure to fluorescent light	0.05	0.05	0.04	0.02



Dark whole days	0.05	0.05	0.05	0.03

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ITOFINISH STAYS FRESH 2

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AMMONIA DECOMPOSITION TEST

The test method described herein is to evaluate decomposition of ammonia by photocatalystic reaction. In general, an ammonia solution turns red in color when phenolphthalein reagent is added to the solution, and it returns to colorless when the ammonia is decomposed. Fabric treated by ITOFINISH STAYS FRESH 2 is put into such an ammonia solution and is exposed to ultraviolet radiation. Then the decomposition of ammonia is evaluated by observing color variation of the solution.

Test conditions:

Using 18 ml of an Aqueous solution including 10 ppm of ammonia, drop 2 – 3 drops of Phenolphtalein into the ammonia solution to make the solution go a visible red color.

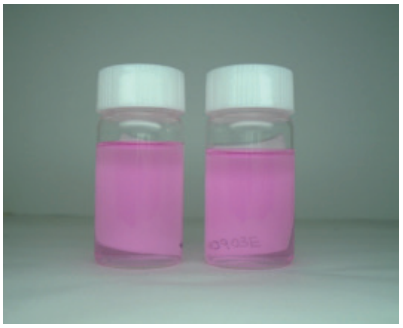
Specimen: A 3 x 3.5cm 100% polyester. Glass Bottle volume is 20ml.

(Untreated fabric in the left bottle, treated fabric by ITOFINISH STAYS FRESH 2 in the right bottle)

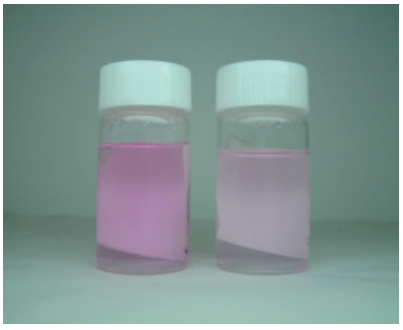
UV exposure by 2 pieces of black light 20W from 5 cm in front of bottles

Untreated fabric

Treated by ITOFINISH STYAS FRESH 2



Initial



After 1 hour

Non-Treated

Ammonia is not decomposed as it remains in the solution with red colour.

And it is even absorbed into the fabric

Treated

decomposed the red coloured ammonia

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ITOFINISH STAYS FRESH 2

TEST REPORT

Date: June 17, 2004

Date of receipt : June 12, 2004

Specimens : Baby clothes (*) treated by Itofinish Stays Fresh 2

(*) 1. Tights 2. Short pants

3. Socks 4. A baby bib

5. A diaper 6. Mittens

1. Purpose and method of test

Photocatalystic function test and methylene blue test

2. Treatment

Substrate was dipped in treatment liquor of Itofinish Stays Fresh 2 diluted with 40 parts of water, squeezed to 100% pickup, dehydrated, and dried naturally.

3. Test conditions

UV irradiator	3 pcs. of Black lamp (equivalent to 40W FL40S-BLB) set in parallel
Size of specimen	5 cm x 5 cm
Distance between specimen and UV irradiator	3 cm
Pre-treatment	Specimen was exposed to UV radiation for 4 hours
Methylene blue solution	5 mg/l x 20 ml (3.3 mg/l x 30 ml for mittens only)

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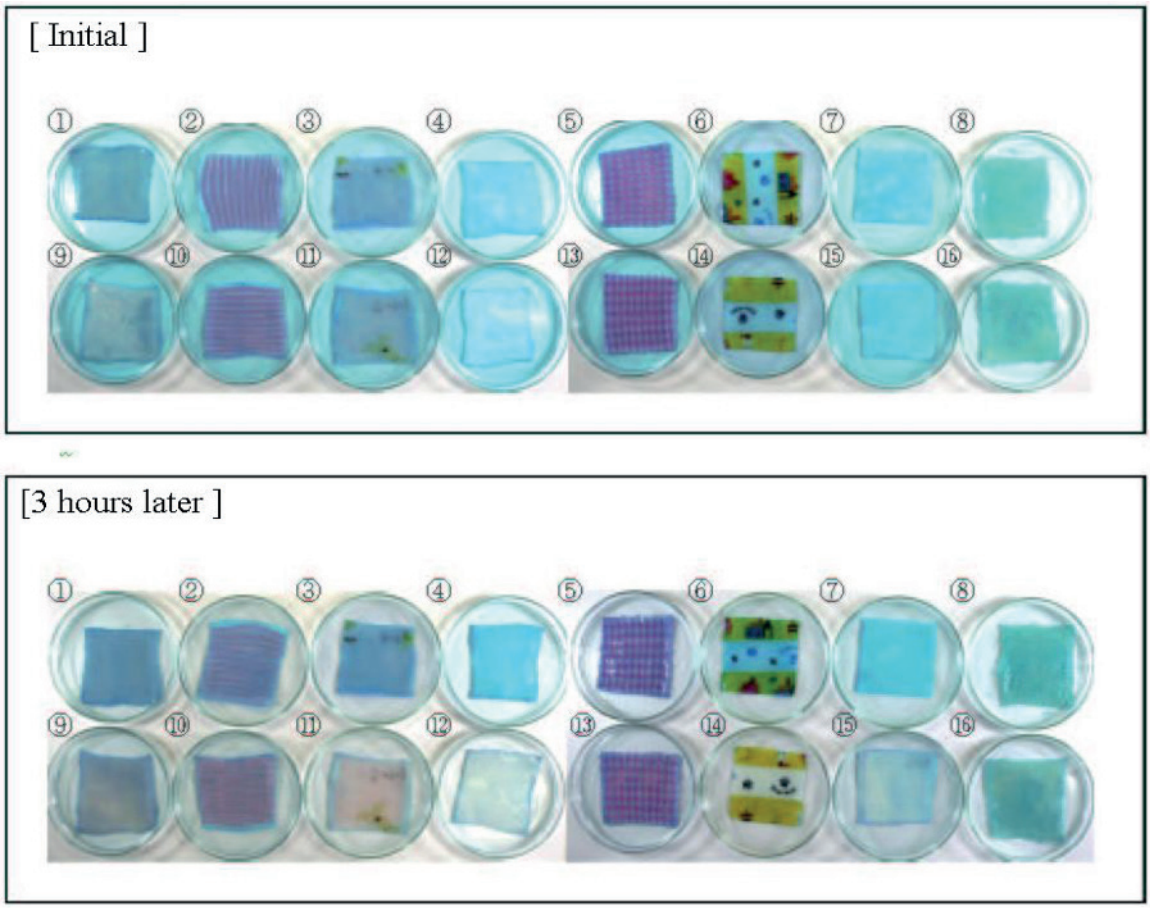
ITOFINISH STAYS FRESH 2

TEST RESULT

Photocatalysitic action was confirmed on all of specimens because methylene blue discolored on all of them.



1	9	Tights	1 – 8	Blank
2	10	Socks	9 – 16	Treated by Itofinish Stays Fresh 2
3	11	Diaper (face)		
4	12	Diaper (lining)		
5	13	Short pants		
6	14	Baby bib (face)		
7	15	Baby bib (lining)		
8	16	Mittens		

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ITOFINISH STAYS FRESH 2

TEST RESULT

TEST CERTIFICATE

Date: May 21, 2004

This reports the test result for the following specimen.

Date of receipt: May 17, 2004

Specimen: Wool treated by ITOFINISH STAYS FRESH 2): beige and black

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[Test item]
Antibacterial test

[Bacterial strain]
Staphylococcus aureus ATCC 6538P

[Test method]

Size of specimen	: 5 x 5 cm (spread it out inside a vial container)
UV irradiator	: 1 pce. of a black light fluorescent lamp (equivalent to 20W FL20S-BLB)
Culture condition	: Specimen is exposed to UV radiation for 5 hours beforehand Black light fluorescent lamp and vial container are placed 40 cm apart in parallel in an incubator, and incubated as exposing to UV radiation.

Measurement of the number of active bacteria : Colony method

[Test result]

Initial number of bacteria [A]	2.4×10^4	log A 4.4
Number of bacteria on blank [B]	1.2×10^7	log B 7.1

(Standard cotton fabric is used as blank, with which bacteria are cultured in the dark condition)

log B – log A = 2.7 > 1.5

Ratio of sterile and active value = log A – log D

Ratio of bacteriostatic and active value = log B – log D

Number of bacteria on blank [C]	5.9×10^4	log C 4.8

(Standard cotton fabric is used as blank, with which bacteria are cultured according to GAEA method)

Specimen	Number of bacteria log D		
Treated wool fabric: beige	1.3	3.1	5.8
Treated wool fabric: black	1.3	1.1	3.8

(Note) Bacterial liquid was used in which 0.05% surfactant (Tween 80) was added.

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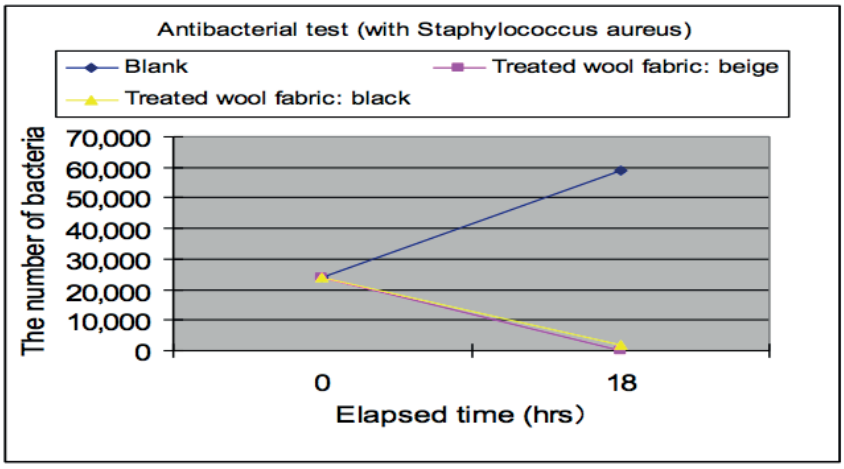
ITOFINISH STAYS FRESH 2

TEST RESULT

	0 hour	18 hours later	Remarks
Normal culture	2.4×10^4	1.2×10^7	Cultured in the dark condition
Blank	2.4×10^4	5.9×10^4	Cultured according to GAEA method
Treated wool fabric: beige	2.4×10^4	20	Cultured according to GAEA method
Treated wool fabric: black	2.4×10^4	2,000	Cultured according to GAEA method



(Note) Bacterial liquid was used in which 0.05% surfactant (Tween 80) was added.

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ITOFINISH STAYS FRESH 2

TEST REPORT

Date : July 16, 2004

Date of receipt : July 13, 2004

Specimens : Clothes treated by ITOFINISH STAYS FRESH 2

5. Purpose and method of test

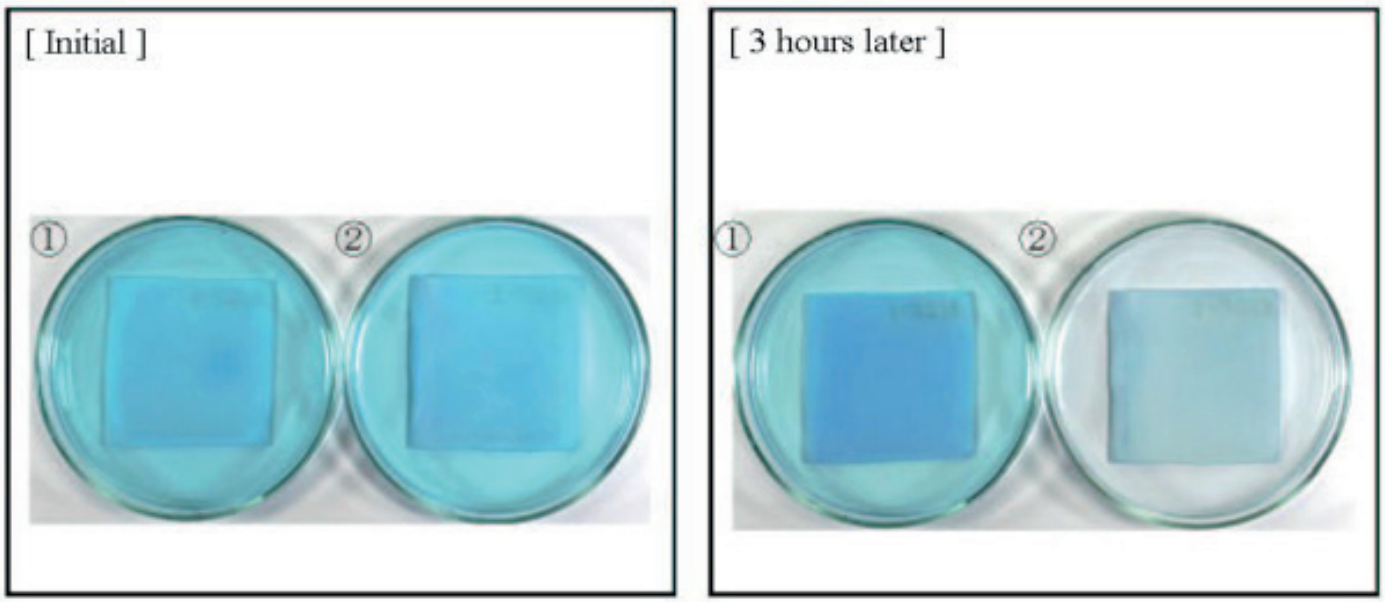
Photocatalystic function test and methylene blue test

6. Test conditions

UV irradiator	3 pcs. of Black lamp (equivalent to 40W FL40S-BLB) set in parallel
Size of specimen	5 cm x 5 cm
Distance between specimen and UV irradiator	3 cm
Pre-treatment	Specimen was exposed to UV radiation for 4 hours
Methylene blue solution	5 mg/l x 20 ml

7. Test result

Photocatalysitic action was confirmed on the specimen because methylene blue obviously discolored



① 1 (blank) ②2 (treated by Itofinish Stays Fresh 2)

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ITOFINISH STAYS FRESH 2

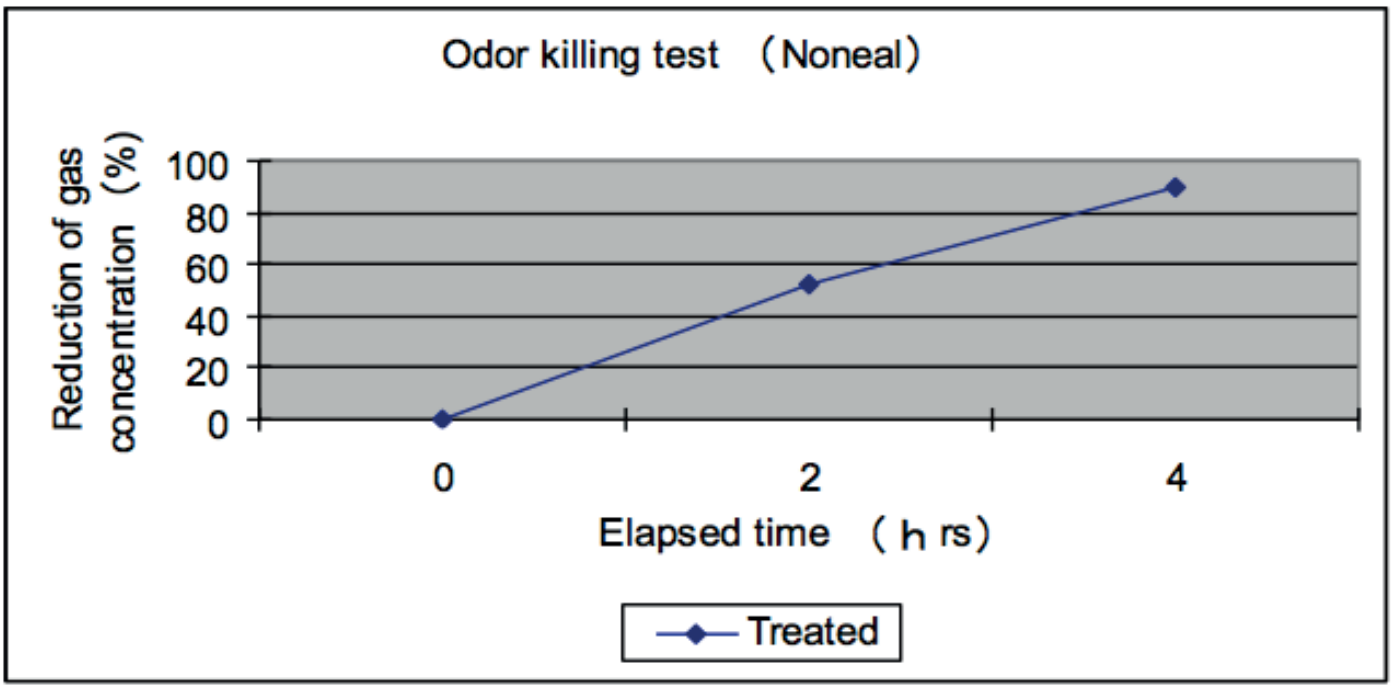
TEST REPORT

Effect of fabric treated by ITOFINISH STAYS FRESH 2 to odorous elements (noneal)

Test conditions

- **Specimen :** 100% cotton fabric treated by Itofinish Stays Fresh 2
- **Test method :** Gas-chromatography method
- **Ultraviolet strength :** 1 m W/cm^2
- **Tested by :** Japan's spinners' association

Specimens were put in a bag containing gas. As exposing it to UV radiation, reduction of gas concentration after 2 hours and 24 hours was measured.



(NOTE) Noneal is the odor of aged old human being.

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ITOFINISH STAYS FRESH 2

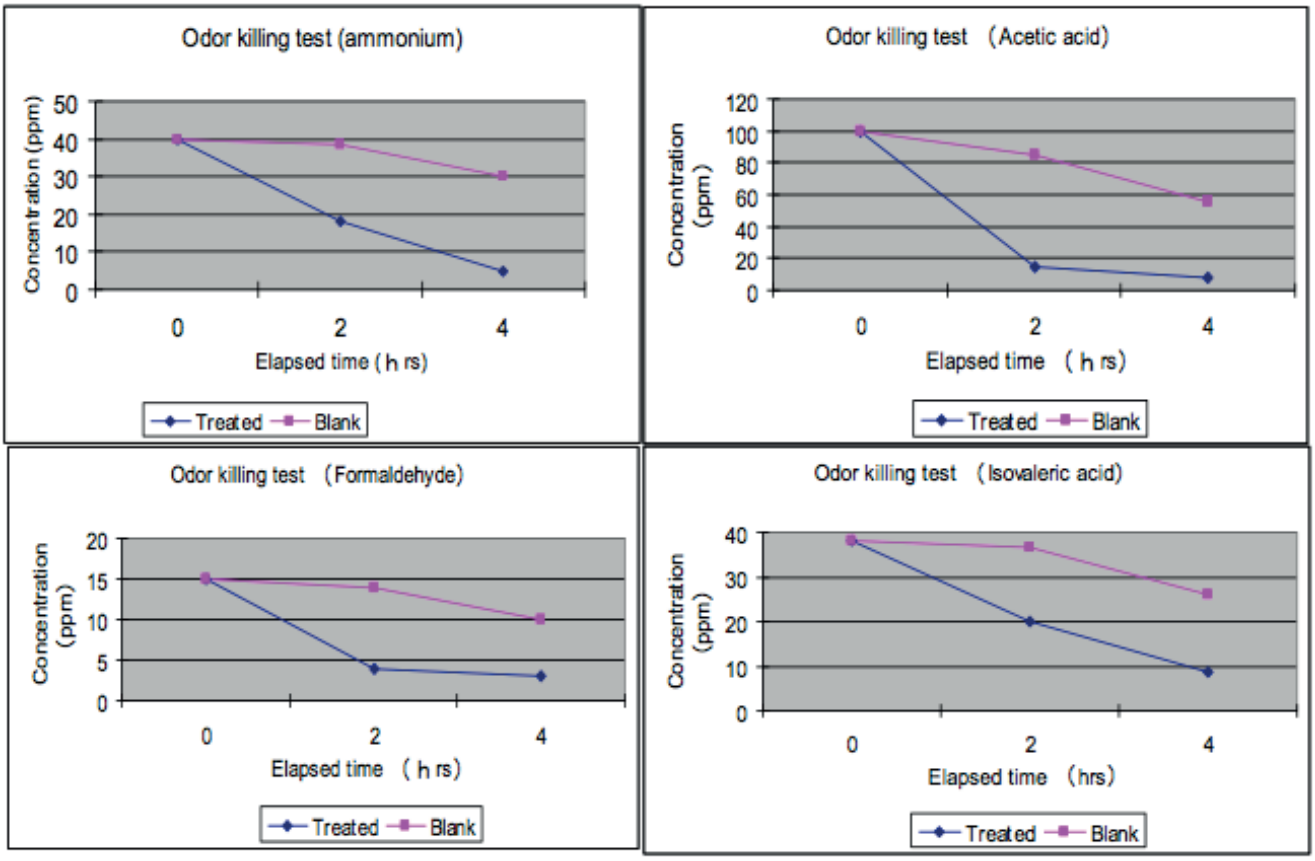
TEST REPORT

Effect of fabric treated by ITOFINISH STAYS FRESH 2 to odorous elements

Test conditions

- **Specimen :** 100% cotton fabric treated by ITOFINISH STAYS FRESH 2 (10cm x 10cm)
- **Test container :** 5-litre Tedlar bag
- **Gas amount in the container :** 3 litres
- **Initial concentration of gas :** Ammonium 40 ppm
  Acetic acid 100 ppm
  Formaldehyde 15 ppm
  Isovaleric acid 38 ppm
- **Condition of exposure to ultraviolet radiation :** 2 pcs. 20W black light set in parallel 10 cm upper from specimen (almost equivalent amount of UV radiation to the same outside in clear sky)
- **Tested by :** Japan's spinners' association

Specimens were put in the bag containing gas. As exposing it to UV radiation, gas concentration after 2 hours and 24 hours was measured by a detecting tube.



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ITOFINISH STAYS FRESH 2

TEST REPORT

Properties of ITOFINISH STAYS FRESH 2 photocatalystic treatment agent

Presence or absence of effect to fabric substrate

In order to make sure that ITOFINISH STAYS FRESH 2 does not decompose fabric substrate, treated fabric was exposed to ultraviolet radiation, and variation in weight of treated fabric was measured. The following result shows that Itofinish Stays Fresh did not decompose the fabric substrate because there was no variation in weight even if kept exposing to ultraviolet radiation.

Test method

Prepare specimen: 20 g/m^2 of ITOFINISH STAYS FRESH 2 was sprayed to specimen of 100% polyester fabric, and dried thoroughly at 90°C (specimen size: 15 x 20 cm in size, initial weight: 2.29 g). On the other hands, a control was made for comparison by spraying 15 g/m^2 of a counter product of photocatalystic treatment agent to another same-sized specimen (initial weight: 2.39 g).

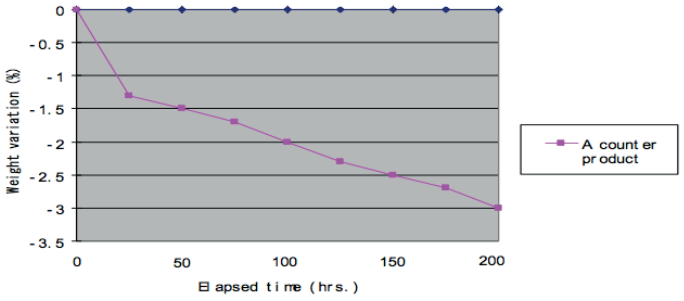
Note: Itofinish Stays Fresh 2 and a counter product were sprayed to each specimen more than standard dose in order to magnify weight variation.

Expose to ultraviolet radiation: 20W black lights were set in parallel, and specimens were exposed to ultraviolet radiation 3 cm upper from them.

Measurement condition: Weight of specimens were measured by an electronic balance, sensitive to 0.01 g

Test result

- Variation in weight is shown in the following graph (variation converted on a percentage basis as 100% of initial weight).
- Weight of specimen treated by Itofinish stays Fresh 2 was not reduced, that exhibited no damage on fabric substrate.
- A counter product applicable for interior clothes and car seats was tested this time. According to our preliminary analysis, we suspected that it might damage substrate because of no element to inhibit substrate decomposition. The test result showed that a counter product decomposed substrate as we suspected.



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ITOFINISH STAYS FRESH 2

PROTEIN DECOMPOSITION TEST

Fabric: 35/65 polyester/cotton

Sample 1: 25g/l ITOFINISH STAYS FRESH 2

Sample 2: Untreated

The two fabrics were stained using egg, washed with water and then dried naturally by direct sunlight.

Ninhydrin reagent was sprayed onto the fabrics to show the residual protein on the fabric from the stain (the deeper the staining the more protein is present)

25g/l ITOFINISH STAYS FRESH 2	Untreated
	

The above results show that the ITOFINISH STAYS FRESH 2 has broken down the egg protein stain as it is much less stained by the Ninhydrin reagent compared to the untreated.

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