

Case 23. Color change by nitrogen oxide



Technical Consultation
Claim

Color change by nitrogen oxide



Technical Consultation **Claim**

Case 23. Color change by nitrogen oxide

① Outline of the case

- Summary : After keeping a pink blouse for one year, the color of its sleeve and side part have changed.
- Fiber label : 100% Acetate
- Care label :



Hand wash



Only non-chlorine bleach
when needed



Steam iron,
Warm iron
(150 C) (300 F)



Tetrachloroethylene
or petroleum solvent
Normal cycle

② Similar cases

- (1) After sewing khaki colored pants (100% cotton), it was folded and piled up in the mill and then yellowing appeared according to the folding line.
- (2) When the folded blue blouse (100% acetate) which was on the top of the pile in the closet was taken out to wear, it was found that the body part had been stained.

③ Cause of the quality inferiority

- (1) Color change appears since the molecular structure of dyestuffs is changed when nitrogen oxide in the air reacts with the dyestuffs.
- (2) Nitrogen oxide: A kind of air pollution gas from combustion of the heater, gas stove, boiling apparatus, etc. indoors and exhaust gas of cars outdoors.

④ Products in which the quality inferiority happens easily

- (1) Some of cotton products dyed with reactive dyestuffs
 - ① When the dyestuffs which is poor in colorfastness to nitrogen oxide was used
- (2) Some of acetate and nylon products dyed with disperse dyestuffs

⑤ Conditions and parts in which the quality inferiority happens easily

- (1) When the product was kept or left in the place where the polluted

(3) Judgment

- ① If the test result is under test requirement, explain that the product has a problem of color change due to nitrogen oxide gas.
- ② If the test result is over test requirement, explain that the discoloration could be caused by the keeping situation.
- ③ For new products or ones with no data, deal with claims in a businesslike way considering its using situation.

⑧ Cautions and measures required in planning or producing a product

- (1) Since the products (including mixed products) made of acetate, nylon, etc. are dyed with disperse dyes in many cases, check the colorfastness to nitrogen oxide gas etc. and use the proper products to meet test requirement.
- (2) For the inferior products made of cotton etc. which are judged as discoloration due to nitrogen oxide gas, change the dyestuffs for the same kind of fabric next time.

⑨ Information to be provided to the customer at a shop in sales

- (1) Explain the precautions to prevent color change by gas during storage.
 - ① Avoid high temperature and humidity during storage and do not expose the product to the polluted gas etc.
 - ② Ventilate and dry the products well 1~2 times per year for keeping long time.

⑩ Others

- (1) Most color changes during storage are not caused by not only gas, but also high temperature and humidity.

[Test Method]

- ISO 105-G01 Textiles- Tests for colour fastness- Part G01: Colour fastness to nitrogen oxides
- ISO 105-N05 Textiles- Tests for colour fastness- Part N05: Colour fastness to storing

Case 24. Color change by BHT and vanillin



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Color change by BHT and vanillin



Case 24. Color change by BHT and vanillin

① Outline of the case

- **Summary :** The color of shoulder parts(pad) of a white one piece dress changed to vivid lemon yellow (by BHT).
- **Fiber label :** Shell : 80% Rayon, 20% Polyester, Lining : 100% Polyester
- **Care label :**



Do not wash



Only non-
chlorine bleach
when needed



Steam iron,
Warm iron
(150 C) (300 F)



Petroleum
solvent only
Normal cycle

② Similar cases

- (1) A white blouse made of 100% polyester: The color of left part was changed to vivid lemon yellow by BHT. Customer's care history was not known.
- (2) A slip made of 100% silk: The color of lace parts was changed to yellowish. Lace was made of cotton and nylon, but only nylon yarn became vivid lemon yellow by BHT.

③ Cause of the quality inferiority

- (1) BHT(Butylated hydroxy toluene)

The antioxidant, BHT is attached to a garment and generates yellow material by reacting with acidic gas in the air. BHT is used for plastic, rubber, machine oil, adhesives, urethane foam, etc. and it sublimates.

- (2) Vanillin

Vanillin is natural phenol group material made from decomposition of lignin in wood. It is used for a veneer board, a corrugated cardboard, etc. If vanillin sublimates and attaches to a garment, it causes the yellowing by reacting with nitric oxide gas in the air.

④ Products in which the quality inferiority happens easily

- (1) Yellowing by BHT

Yellowing generally occur by external factors, and is not limited to the specific fiber or product.

- (2) Yellowing by vanillin

Nylon or nylon blended product

⑤ Conditions and parts in which the quality inferiority happens easily

(1) Yellowing by BHT

In case that BHT is contained a lot in the material, for storage or display, such as packing material, hanger, furniture, construction material, yellowing can occur when the product approaches or contacts with them.

(2) Yellowing by vanillin

- ① In case of storing unpacked nylon product in a corrugated cardboard
- ② In case of using unbleached paper etc.

(3) In condition of (1) or (2), yellowing can occur on the part which can be easily influenced by acidic gas. For example, if the product is stored as hung on hanger, yellowing can occur mostly on sleeves, bodice, side, etc. which can contact with the air.

⑥ Countermeasures of a shop against customer's complaint

(1) Consult with the customer about wear history of the inferior product :

- ① The date of purchase
- ② The period of wearing
- ③ The situation of wearing
- ④ The situation of storage: Was the plastic bag used?
- ⑤ The place of storage
- ⑥ The period of storage
- ⑦ Did yellowing occur on the other white product which was stored with the problematic product?

(2) After ascertaining (1), inform the customer that it can take a certain period of time to find out the cause.

⑦ Explanation of test method and judgment criterion for dealing with customer's complaint

(1) Explanation should be based on the test results.

(2) Test method for identifying BHT(Butylated hydroxy toluence)

- ① In case of phenolic yellowing, i.e. the discoloration of textiles caused by BHT(antioxidant)
 - It is eliminated by sunlight exposure(4~5 hours)
 - It is eliminated by acidic gas (acetic acid gas etc.), but phenolic yellowing occurs again by alkaline gas (recovery).

(3) Judgment

- ① In case that the product can easily become yellowish, give an explanation that there are some problems in product quality.

- ② In case that the product can be restored, restore and give back the product, and explain the cause of color change and proper storage method.
- ③ For new products or ones with no data, deal with claims in a businesslike way considering its wearing period or used condition.

⑧ Cautions and measures required in planning or producing a product

- (1) In final finishing process, it is necessary to neutralize and rinse the product sufficiently for removal of alkali, or maintain weak acidic condition (below pH 5.5) by using safe and low volatile organic acid(citric acid, glycolic acid).
- (2) Use the plastic bag which does not contain BHT and also use the packing material which has good gas barrier property. Polyethylene bag absorbs gas well.
- (3) Use the softener which has yellowing resistant property.

⑨ Information to be provided to the customer at a shop in sales

- (1) Explain the following method for yellowing prevention.
 - ① Avoid hot and humid condition and harmful gas during product storage.
 - ② In case of storing for a long time, it is advisable to give a good airing and dry the product once or twice a year.

⑩ Others

- (1) Mending method for yellowing due to BHT
 - ① Dry or wet cleaning ② Exposure to sunlight

[Test Method]

– ISO 6463 Determination of butylhydroxyanisole(BHA) and buxylhydroxytoluene(BHT)– Gas – liquid chromatographic method