Yellowing Test Kit

Product Information

Product description:	706-708	Impregnated Test Papers
	706-709	Control Fabrics
	706-792	BHT-free Polythene Film (63 microns)
Use:	Phenolic Yellowing – Courtaulds Method	

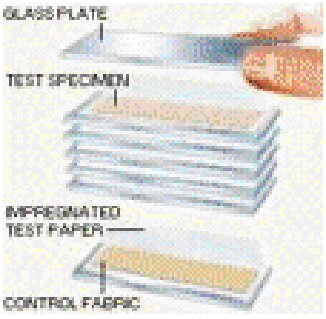
General information

Purpose
This is a simple, relatively low cost, predictive test to assess the *potential* of white or pastel-coloured yarns, fabrics or garments to yellow in transit or in storage.

Scope
The test is specific to phenolic yellowing, that is, the discolouration of textiles caused by the action of oxides of nitrogen (NOx) on yellowable phenols. It is not intended to deal with the many other causes of discolouration, e.g., the migration or fading of optical brightening agents, gas fume fading, and the oxidation of fabric lubricants and so on. However, the Yellowing Test Kit has proved to be an effective means of controlling the quality of white and pastel-coloured goods and has considerably reduced the incidence of yellowing complaints.

Background
The phenolic yellowing test was developed by Courtaulds Research for investigating complaints arising from “storage yellowing”. The test is now widely used and is recommended by a number of major retailers, e.g., Marks and Spencer and Tesco.

Test Procedure
The risk of phenolic yellowing is evaluated by a contact test. The procedure is based on a test paper, which has been mechanically impregnated with a methanol solution containing the phenolic compound. The test paper is folded along its axis and the specimen to be tested is sandwiched between the two layers. The sandwich is then placed between two glass plates. (Do not use acrylic or plastic plates).



A standard test package consists of five (5) test specimens and one (1) control fabric - each separated by a glass plate - making a total of seven (7) glass plates. If there are more than five test specimens, additional test packages are prepared. Each package is wrapped in BHT-free polythene film. The packages are closed and sealed with ordinary adhesive tape. To ensure uniform contact between the test papers and the test specimens, the packages are placed in a perspirometer - up to three (3) test packages in one instrument. The pressure is standardised by the application of a weight. Up to four (4) perspirometers are placed in an incubator or oven, at a temperature of 5O° ± 3°C. The treatment time is 16h, which permits one day's specimens to be incubated overnight and to be assessed on the following day. At the end of the test, the perspirometers are removed from the incubator or oven, the test packages are taken out and are allowed to cool. The test is considered valid, if the control fabric has turned yellow. The specimens are compared with their originals, and the intensity of yellowing is assessed with a standard grey scale (or relative yellowness index values).

Quality Assurance
Internal performance testing.

Storage
These products are manufactured to provide you with test materials of reliable quality and performance. In order to maintain this high quality please store the products in a cool, dry and dark place. When not in use keep the containers and packages firmly and tightly sealed. Once opened store in cool and dry conditions with container tightly closed, and dispose of after 6 months.

Applications
Suitable for use in procedures specified in:

- ISO 105 X18
- AATCC Test Method (draft)
- M&S C20B
- Tesco TM/137/01
- Adidas-Salomon Test Procedure 5.10

BHT
The phenolic antioxidant butylated hydroxytoluene (BHT) was patented in 1947 and received approval for use as a food additive and preservative by the Food and Drug Administration (FDA) in 1954. Since 1959, BHT has been generally recognised as safe (GRAS) for use in foods and is one of the most commonly used antioxidants in foods containing fats. BHT is not carcinogenic for F344 rats or B6C3F1 mice.

BHT is also widely used as an antioxidant in the manufacture of polyethylene films used for packaging. BHT sublimes and migrates easily to items in close proximity.

The results of investigations concerning the yellowing of stored textiles were reported by Du Pont chemist Kenneth C Smeltz at the Atlanta meeting of the American Institute of Chemical Engineers. As reported in Chemical and Engineering News (March 26, 1984, pg. 27) Smeltz implicated the common antioxidant butylated hydroxytoluene (BHT) and environmental nitrogen oxides in the formation of 2,6-di-tert-butyl-1,4-quinone methide.

Yellowing occurs when certain conditions are present while fabrics or garments are being stored. These conditions are alkaline finishing, the presence of moisture, nitrogen dioxide present in the air, and storage in polyethylene bags or film containing butylated hydroxytoluene (BHT). Typically, the fabric or garment is finished by the manufacturer or washed by the launderer on the alkaline side. It is steamed, covered with a polyethylene wrap or bag containing BHT, and stored in a mill, warehouse, or plant, usually in darkness. With time, nitrogen dioxide reacts with BHT released from the bag or film, especially around openings, perforations, or holes, and this reaction causes yellow stains. The compound produced from this reaction, 2,6,2',6'-tetra-tert-butylstilbene-4:4'-quinone, is intensely yellow (often described as canary yellow, or lemon yellow).

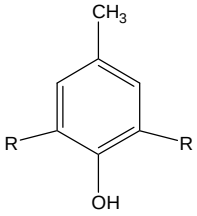
The remedy is to reduce the NOx level in the air, or use bags not containing the fugitive antioxidant BHT, or finish all white and pastel-coloured goods on the acid side.

Many have taken the one-sided view that textile finishers should use citric or glycolic acids to finish fabrics to an acidic state. No mention is made of whether these would be intended to be washed out at a later date or if they might cause unforeseen problems of their own. For example, the over use of the non-volatile citric acid on cellulosic fabrics can have detrimental effects on the strength of the fabric, i.e., it can cause tendering and in some cases yellowing.

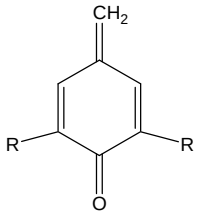
Less than 2ppm of NOx and less than 5ppm of BHT can give rise to noticeable discolouration under the specific conditions.

Chemistry of BHT Yellowing

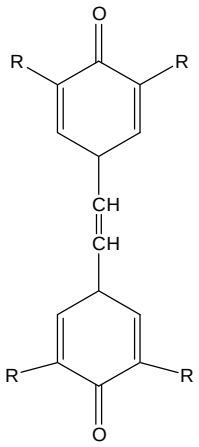
The figure below illustrates the transformation of BHT to stilbene quinone. The reaction is not simple and this is a simplified scheme showing only the main stages.



Butylated Hydroxy Toluene (BHT)



Quinone Methide



Stilbene Quinone