Fabric Yellowing During Storage

Yellowing of white or light colored fabrics and garments during storage was causing problems for manufacturers and retailers until the actual cause was discovered. Although not all garments or fabrics were turning yellow, “Polyester containing certain fluorescent brightening agents will turn to green-yellow; virgin nylon 66 will change to straw yellow; polyester or cotton become orange-yellow; and wool will turn straw yellow,” under certain conditions.

The Cause

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 yellowing due to this reaction should not be confused with natural overall yellowing that occurs in some fibers such as wool or virgin nylon. The stains caused by BHT during storage are usually rings, spots, or streaks on areas near openings, perforations, tears, or holes in the bag or film.

BHT may also be found in foam shoulder pads of ladies’ garments, polyurethane furniture cushions, soaps, cardboard cartons, glue, and cosmetics.

Prevention

- The manufacturer should finish all light or white fabrics and garments on the acid side. If the pH is 5.5 or less, the yellowing problem probably will not occur.
- Use ethylene bags or film that does not contain BHT, BHT is no longer added to polyethylene by the manufacturer, but trace amounts may still occur. Cellophane can be used as an alternative.
- Keep storage areas as free as possible from outside polluted air. Air pollution increases the amount of nitrogen dioxide in the air.

Restoration

Exposure to sunlight or ultraviolet light will cause the yellow to disappear, but this is not permanent. If the fabric or garment is reexposed to the BHT and nitrogen dioxide, the yellow will reappear. This also occurs if alcohol, hydrogen peroxide, or acetic acid is used to remove the stains.

Drycleaning or laundering will remove the yellow and will eliminate the problem permanently if the finish used by the manufacturer is solvent or water soluble. In laundering, the garments should be rinsed well or a sour used to neutralize the alkali.

Summary

Yellowing of fabrics and garments during storage in polyethylene or wrappers can happen with most types of fiber.

Four conditions are necessary for the yellowing to take place. They are the presence of BHT, nitrogen dioxide, moisture, and alkali finished or washed fabrics. Temporary restoration is possible with exposure to sunlight, ultraviolet light, alcohol, hydrogen peroxide, or acetic acid. Restoration or permanent elimination of the problem is possible with drycleaning or laundering.

This bulletin was written by Bettie Nash, IFI Assistant Research Chemist.