

# Damage to Upholstery Fabrics Caused by Hidden Flame Retardants

**By Tim Nelson**

*Executive Summary*

## **Residential upholstered furniture is flammable.**

California is the only state with a flammability standard for residential upholstered furniture. Technical Bulletin 117 (TB 117), passed in 1975, specified test procedures for all residential upholstery. With California representing a substantial portion of their business, many furniture manufacturers chose to implement TB 117 for their entire lines, thus assuring that furniture manufactured to the new standard would be shipped throughout the U.S.

TB 117 specified that any feather-type filling material had to be encased in a flame retardant ticking. “Down proof” cotton ticking was already widely used in the furniture industry, so the standard was met by applying flame retardant chemicals to these fabrics.

Cotton is easy to treat for flame resistance. In fact, the least expensive types of flame retardant chemistries tend to perform well when applied to cotton. These chemicals are water soluble, but in certain less-demanding applications, such as cotton ticking, they are an attractive solution.

These flame retardant chemicals decompose over time, forming acids. When a down-filled ticking is placed inside a cover fabric to form a seat cushion, the ticking and the cover fabric are in intimate contact. Any chemicals applied to the ticking are likely to transfer to the cover fabric. Cotton is susceptible to damage by acids. Acids cause hydrolysis of the cellulose polymer, resulting in a weakening of the fiber. This damage is often accompanied by yellowing or browning, especially on lightcolored

fabrics.

Flame retardant-induced browning of cotton often looks similar to “cellulosic browning.” However, the browning due to flame retardant is caused by actual fiber damage, similar to the yellowing and eventual embrittlement of old newspaper. It is not correctible or preventable with application of acidic chemicals such as those used as rinse agents.

Certain fabric dyes also seem to be particularly sensitive to the effects of acid byproducts of flame retardant chemicals. The color changes can be remarkable.

**Furnishings exhibiting flame retardant ticking problems tend to share several characteristics:**

- Cover fabrics are almost always cotton (or cotton blends).
- Cushions are affected, but rarely other areas.
- Blotchiness.
- Absence of discoloration in narrow areas directly adjacent to seams.
- Acid pH.

Migration of flame retardant from cotton ticking can occur without any outside influence. Given enough time, exposure to atmospheric moisture is enough to cause the transfer of the flame retardant from the ticking to the cover fabric.

In nearly all flame retardant-related discolorations, corrective measures are in vain. Raising the pH by neutralizing the cover fabric with alkaline chemicals seems a logical remedy, but this process has been ineffective in the vast majority of cases.

Loose cushions should always be inspected for the presence of a cotton ticking. Open a zipper to see what materials are used inside the cushion. If a cotton ticking is found, it should be carefully inspected and pH testing should be performed. It is not unusual for a ticking fabric to be

slightly acidic, with a pH of about 6. However, a pH of 5 should be a concern and 4 or lower is an almost certain sign of problems.

Wet cleaning of upholstery often causes some wetting through to the back of the fabric. Any moisture that comes into contact with the cotton ticking will begin to solubilize the flame retardant chemicals. When solubilized, they easily move to the cover fabric.

Cleaning upholstery containing unsafe flame retardants requires that the ticking be protected from moisture. This can be accomplished by removing the cushion covers and placing the ticking-covered inner cushion inside a plastic bag, then placing the assembly back inside the cushion cover. This allows for normal cleaning without danger of wetting the ticking. After cleaning and thorough drying, the plastic can be removed.

### **ABOUT THE AUTHOR**

TIM NELSON is the Director of Research for Fiber-Seal Systems. A 35-year veteran of the carpet and upholstery care industry, his areas of expertise include chemical formulating, textile analysis and the care of interior textiles. Nelson is also a technical writer and trainer and is a member of the American Association of Textile Chemists & Colorists.