New Study Adds Insights on the Limitations of Smolder-Only Furniture Test

STUDY OVERVIEW

Requiring both smolder and open flame tests for upholstered furniture protects your home from the worst-case fire scenarios. Yet most upholstered furniture in the United States is required to only pass a smolder test. It is known that some furniture meeting a smolder test can still fail in real-world settings, resulting in a large fire.[1]

This study provides insights as to how flame retardant fabrics or foam can and do prevent the transition from a smoldering to flaming event — even when exposed to the strongest ignition source — provided sufficient levels of flame retardants are incorporated in the upholstery fabric or foam.

FIRE SAFETY STANDARDS FOR UPHOLSTERED FURNITURE

Upholstered furniture can be a major contributor to large residential fires, as they are often the largest fuel source in the room.[2,3] Fires that start with upholstered furniture frequently spread quickly beyond the room in which the fire originated.[4]

The U.S. Consumer Products Safety Commission (CPSC) estimates that there are, on average each year, 4,700 fires, 390 deaths, 660 injuries, and $238 million in property losses attributable to incidents where upholstered furniture was the first item ignited.[5]

The addition of flame retardants to the fabric, batting, and foam in upholstered furniture helps prevent ignition — and in the event a fire can't be stopped — provides individuals with increased critical escape time.

While there is currently no national or federal fire safety standard for upholstered furniture, several fire safety and product safety organizations, including the National Fire Protection Association (NFPA) and the CPSC, are working on developing such a standard.

STUDY CONCLUSIONS

Furniture that may meet the smolder test (e.g., cigarette) may still not provide protection from open flame incidents (e.g., candles, space heaters, etc.).

The results from testing found that materials highly prone to smoldering propagated heat into foams and led to ignition, whereas materials that tended to melt back from the ignition source did not.

Flame retardant fabrics or foam can and do prevent the transition from smoldering to flaming, providing additional protection is incorporated in furniture designs.

Dr. Alexander Morgan's work will ultimately help furniture manufacturers and policy makers understand how to improve designs and test methods, thereby keeping people safer from the unintended consequence of furniture fires.

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WHY WAS THE STUDY CONDUCTED?

Existing fire tests for furniture in the U.S. (e.g., California Technical Bulletin 117-2013) are solely focused on resistance to smoldering ignition sources such as cigarettes rather than open flame tests (e.g., candles, space heaters, etc.).

Smoldering is an important furniture ignition challenge and not completely understood. It is well known that smoldering can transition to flaming combustion, which eventually can lead to flashover and notable fire loss, including death. It is important to understand the variables contributing to these events, and this study examined smoldering to flaming transitions in a controlled variable setting.

DETAILS OF THE RESEARCH

The transition from smoldering to flaming was studied on fabric, batting, and foam assemblies via an electric spot ignition source of similar intensity to a cigarette.

The materials studied included four different fabrics (cotton, polyester, cotton/polyester blend, flame retardant cotton/polyester blend), two types of batting (cotton, polyester), and three types of polyurethane foam (non-flame retardant, flame retardant by FMVSS 302 testing, and flame retardant by BS5852 testing).

CITATIONS

[1,5]U.S. CPSC, Staff Briefing Package: The Feasibility, Benefits and Costs of Adopting TB 117-2013 as a Mandatory National Standard, September 8, 2016.

[2]NFPA, "Home Fires That Began With Upholstered Furniture," February 2017.

[3]NFPA Journal, "Home Fires Involving Heating Equipment," January/February 2012.

[4]NFPA, "Home Fires That Began With Upholstered Furniture," February 2017.

Morgan AB, Knapp G, Stoliarov SI, "Levchik SV. Studying smoldering to flaming transition in polyurethane furniture subassemblies: Effects of fabrics, flame retardants, and material type." Fire and Materials. 2020; 1–12. https://doi.org/10.1002/fam.2847

The American Chemistry Council's North American Flame Retardant Alliance (NAFRA) is committed to promoting the safe and effective use of flame retardants. Flame retardants can provide an important layer of fire protection by stopping or delaying the onset and spread of fires.

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