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Flammability of Vinyl Foam Backing

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Abstract

Recent studies on the flammability of commercial carpeting are discussed within the framework of smoke generation, toxicity of combustion products and flame retardancy. A number of different formulations including PVC have been evaluated.

Although there is presently considerable concern about smoke and toxic gas generation during a fire, the major emphasis must be toward new concepts in flame retardation. In addition new methods of measuring and evaluating toxic gases are needed.

The tremendous need for new flame retardant materials which also afford smoke and toxic gas retardation presents a challenge to the vinyl industry that can not be ignored. Stricter federal legislation in the area of flammability, toxic gas and smoke generation makes this challenge all the more urgent.

To meet this challenge, a program dealing with the various aspects of flame retardation is now being formulated.

The following exerpts were extracted from an article published in the Plain Dealer (2/9/70) with regards to the Marietta Nursing Home fire.

> "The carpeting and backing throughout the facility were burned away; it appeared that heavy, dense acrid smoke was generated from the smoldering or burning of this carpeting, creating the deadly atmosphere."
>
> "The fire spread very rapidly, and it is the feeling of the investigators that the carpeting and rubber backing... contributed to the spread of the fire and was the cause of the heavy, dense, black smoke."

This fire has initiated a series of Senate hearings into the adequacy of the Flammable Fabrics Act of 1967. The carpeting in the Marietta Home (reportedly of Nylon/SBR composition) met the minimum requirements under the FFA. The fact that all carpeting material will undergo increased scrutiny with respect to flammability, toxic combustion products and smoke generation has prompted a number of questions about vinyl carpet backing. How does it compare with SBR and other materials with respect to the above considerations?

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Is vinyl carpeting potentially more dangerous than other materials since it releases a stoichiometric amount of HCl during combustion? Is there toxicological synergism with HCl and carbon monoxide (as with HCN and CO)? How does vinyl carpet backing compare with other materials with respect to smoke generation? What effect does heat generation, during a fire, have on toxic gas and smoke generation?

The objective of this paper is to answer some of these questions within the framework of recent government sponsored studies and to show the need for further studies in the area of toxicity, flame retardancy and smoke generation. This need is due not only to the fact that there will be future federal legislation in this area but also due to the fact that much of the work in the past (especially with respect to toxicity) is totally inadequate for today's needs.

Primary Causes of Death in a Fire

At a recent symposium on the flammability of synthetic materials,[1] Prof. I. Einhorn, symposium chairman, related that in his discussions with people in the fire prevention business, the causes of death in a fire (in order of decreasing importance) are:

1. asphixiation due to oxygen depletion
2. effects of superheated air
3. impairment of visibility by smoke
4. toxic effect of gases
5. heat from the fire and
6. varying degrees of 1-5

Thus in most fires asphixiation due to oxygen depletion (or dense smoke) is the major cause of death.

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