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RESEARCH AND DEVELOPMENT DIVISION

Smoke Reduction Mechanisms in PVC.

VI. The Performance of Smoke Retarders in Head-To-Head PVC During Pyrolysis and Combustion

by

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SUMMARY

This report presents a study of the pyrolysis and combustion behavior of head-to-head (H-H) PVC and smoke retarded H-H PVC. The results provide additional support for our conclusion that the primary role of metal smoke retarders in PVC is to promote crosslinking during the early stages of dehydrochlorination via a "reductive coupling" mechanism.[3,7,22]

H-H PVC differs structurally from H-T PVC in that it consists of alternating 1,2-dichloroethylene and ethylene groups along the chain. Because the chlorines are always on adjacent carbon atoms, H-H PVC should have a different pattern of thermal degradation compared to "normal" heterotactic head-to-tail (H-T) PVC. We find that relative to H-T PVC, H-H PVC produces less aromatic pyrolyzate (benzene and toluene), less smoke and more char. This is consistent with the results of the H-H PVC thermal degradation studies reported in the literature. A review of the literature covering the structure and thermal degradation of PVC is included in this report.

We find that the addition of average performing smoke retarders (such as MoO_3) to H-H PVC gives polymer compounds with superior combustibility characteristics. We conclude that a study of H-H PVC and related polymers could lead to a class of commercially important chlorinated polymers with superior combustibility properties.

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OBJECTIVES

1. To characterize the thermal decomposition of H-H PVC and smoke retarded H-H PVC using PY-GC and the Smoke Char Test.

2. To determine if metal-based smoke retarders are as effective in H-H PVC as in H-T PVC.

3. To test our theory that the primary role of metal-based smoke retarders is to promote crosslinking during the initial stages of dehydrochlorination via a "reductive coupling" mechanism.

4. To review the key literature which details the structure and thermal decomposition of H-H PVC and related polymers.