

Flame-Retardant Mechanism and Thermal Behavior in Polyester  
Fabrics Treated With Bromine Compound/Antimony Trioxide.

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Chlorine-antimony synergism, the mechanism for synergistic effects, and the flame retardancy mechanism of the polyester fabrics treated with a mixture of the organochlorine compounds/antimony compounds have been well established, but those for a mixture of the organobromine compounds/antimony compounds are not yet fully understood.

This study was, therefore, undertaken to elucidate bromine-antimony synergism and the flame-retardant mechanism of the polyester fabrics treated with a mixture of organobromine compounds/antimony trioxide. For this purpose five aromatic bromine compounds with a relatively high bromine content such as decabromodiphenyl oxide, octabromodiphenyl oxide, hexabromocyclododecane, pentabromotoluene, and hexabromobenzene were chosen. Polyester fabrics were treated with the aqueous dispersion solution of a mixture of bromine compounds/antimony trioxide together with binder. Bromine-antimony synergism was confirmed by plotting the LOI values against bromine/antimony weight ratio.

Bromine-antimony synergism was inferred by comparing thermogravimetric and differential thermal analysis curves of a mixture of bromine compounds/antimony trioxide with those combined mathematically from thermogravimetric and differential thermal analysis curves of bromine compounds and antimony trioxide, respectively.

The flame-retrardant mechanism was studied by the following methods and analyses: examination for the effects of bromine/antimony weight ratio on LOI and  $\Delta H_c$  measured by oxygen bomb calorimeter through thermodynamic consideration of combustion process, measurement of LOI and LNOI with the changes of amount of flame retardants, elemental analysis of flame retardants in the residual char, comparison of residue number calculated by both thermogravimetric analysis and furnace method, respectively, with the amount of flame retardants, and analysis of the thermogravimetric behavior. The gas phase machanism was found to be operative in the polyester fabrics treated with bromine compounds/antimony trioxide.