SL 14.2

New Ecological Polyester Resins with Reduced Flammability. Thermal Studies.

E. Kicko-Walczak
Industrial Chemistry Research Institut, Rydygiera 8, 01-793 Warszawa, Poland

Fire retardant unsaturated polyester resins usually contains chlorine or bromine atoms. The halogens are built-in into the polyester by using halogenated starting materials, e.g. chlorendic (HET) acid or dibromoneopenyl glycol. The other way of reducing flammability of polyesters is addition special flame retardants.
Manufacturing process of novel unsaturated polyester resins by copolymerization has been developed at the Industrial Chemistry Research Institute from epichlorohydrin (ECH), maleic anhydride (MA), phthalic anhydride (PA) and a special molecular weight regulator. No condensate, no water from copolymerisation is formed. The recent development involves the synthesis of unsaturated polyester from ECH, MA, PA and molecular weight regulator serving, moreover, contain 60-70% aliphatic bromine. Inherent fire retardancy is achieved by incorporation a relatively large amount of halogens molecule.
Introducing fire retardancy additives as $ZnSnO_3$ (ZS), $ZnSn(OH)_6$ (ZHS), $Al.(OH)_3$, or $Mg(OH)_2$ and Sb_2O_3 in up to 30 mass % was determined. The most efficient ignition and smoke-evolution retarder from among the investigated compounds were ZS and ZHS, and an essential reduction in smoke evolution was also observed with Sb_2O_3.
Evaluation of the smoke generated during flaming combustion of the halogenated and brominated polyester resins has been carried out by using cone calorimeter.
The thermal decomposition of polyester resins, flame retarded by ZS and ZHS, has been investigated by thermogravimetry (TG) in both dynamic and isothermal mode, and by TG coupled on-line with Fourier transform infra red spectroscopy (TG-FTIR) or mass spectroscopy (TG-MS).
GRP laminates with these polymers meet the fire-safety recommendations concerning smoke evolution from materials used in transportation means, in the building and electronics industry.
References

1. Kicko-Walczak E., Kamiński A., Penczek P.: *Polimery,* 1990, 38, 33.
2. Cusack P. A., Heer M. S., Monk A.W.:*Polym,. Degrad. And Stab*., 1991, 32, 17.
3. Weil E. D., Hirschler M. M., Patel N. G., Said M. M., Shaikr S.:*Fire and Materials*, 1992, 16, 159.
4. Kicko-Walczak E., Grzywa E.: *Fire and Materials*, 1998, 22, 253.
5. Kicko-Walczak E.:*J. Appl. Polym. Sci.*, 1999, 74, 379.
6. Kicko-Walczak E. :*J. of Polym. Eng*., 2003, 23(3), 149-161.