

FLAME RETARDANTS NANOCOMPOSITES ON BASED THERMOSET RESINS.SYNERGY EFFECT OF COMBINING CONVENTIONAL PHOSPHORUS/NITROGEN ANTYPIRENES WITH NANOFILLERS ON THE LEVEL OF FLAMMABILITY

Ewa Kicko-Walczak, Grażyna Rymarz

Institute for Engineering of Polymer Materials and Dyes(IMPiB), Poland
e.kicko-walczak@impib.pl; g.rymarz@impib.pl

Keywords: thermoset resins, fire retardants, test methods

Summary: The consumption of thermoset resins as a building polymers is approximately over one milion tone word wide.The thermoset resins are proven construction materials for the technical and highly demending applicatios of the transportation, electrical,and building part industry. Heat stability, high thermal, low shrinkage, exccellent mechanical properties are typical for their type of polymers. Above application in addition to the mechanical properties also requires a good flame retardants of the materials.

This paper presents positive effect of reduced flammability of thermoset resins(unsaturated polyester resins, epoxy resins)thanks to the use of nanocomposites containing multi-ingredient halogen-free flame retardants witch combine conventional phosphorus/nitrogen modifiers interacting with nanofillers:organomodified montmorillonite, expandable graphite, nanosilica/modified nanosilica.

The flame retardancy and thermal stabilization of modified polymers has been investigated by Limiting Oxygen Index(LOI), by thermogravimetric analysis(TGA); (TG-FTIR),TG-MS) and by using Cone Calorimetric (CC) method.The fine plates , phase morphology of nanocomposites was assessed by scanning electron mictoscopy(SEM).A synergy effect was observed between conventional modifiers and selected nanofillers.We confirm that nanocomoposites formation is an important concept for the flame retardants industry to enhance easily the FR properties of the products. Laminates made of modified and crosslinked polyester/epoxy resins meet requirements concerning heat, thermal stability and LOI over 28-37% flammability, reduced 30-60% HRR and THR by CC method. No adverse impact of modification was ascertained on basic strength properties of final products.

Reference:

- [1] S.Bourbigot,S.Duqusne: J.Mater.Chem.2007,17,2283.
- [2] E.Kicko-Walczak,M.Półka: Przemysł Chem.2010,89⁽¹⁾,66
- [3] K.Wu, K.Kandola,E.Kandare,U.Hu: Polym.Comp.2011,32,3.
- [4] E.Kicko-Walczak, G.Rymarz: Przemysł Chem.2014,93⁽⁵⁾,1000.