

Nanotechnology for Flame Retardancy of Thermoset Resins

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Abstract : In recent years, nanotechnology has been successfully applied for flame retardancy of polymers, in particular for construction materials. The consumption of thermoset resins as a construction polymers materials is approximately over one million tone world wide. Excellent mechanical, relatively high heat and thermal stability of their type of polymers are proven for variety applications, e.g. transportation, electrical, electronic, building part industry. Above applications in addition to the strength and thermal properties also requires -referring to the legal regulation or recommendation - an adequate level of flammability of the materials. This publication present the evaluation was made of effectiveness of flame retardancy of halogen-free hybrid flame retardants(FR) as compounds nitric/phosphorus modifiers that act with nanofillers (nano carbons, organ modified montmorillonite, nano silica, microsphere) in relation to unsaturated polyester/epoxy resins and glass-reinforced on base this resins laminates(GRP) as a final products. The analysis of the fire properties provided proof of effective flame retardancy of the tested composites by defining oxygen indices values (LOI), with the use of thermogravimetric methods (TGA) and combustion head (CH). An analysis of the combustion process with Cone Calorimeter (CC) method included in the first place N/P units and nanofillers with the observed phenomenon of synergic action of compounds. The fine-plates, phase morphology and rheology of composites were assessed by SEM/ TEM analysis. Polymer-matrix glass reinforced laminates with modified resins meet LOI over 30%, reduced in a decrease by 70% HRR (according to CC analysis), positive description of the curves TGA and values CH; no adverse negative impact on mechanical properties. The main objective of our current project is to contribute to the general understanding of the flame retardants mechanism and to investigate the corresponding structure/properties relationships. We confirm that nanotechnology systems are successfully concept for commercialized forms for non-flammable GRP pipe, concrete composites, and flame retardant tunnels constructions.

Keywords : fire retardants, FR, halogen-free FR nanofillers, non-flammable pipe/concrete, thermoset resins

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