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Effects of nano-sized flame-retardant additives on thermal stability and gaseous emissions of intumescent coatings for structural applications

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A combination of bisphenol epoxy resin and flame-retardant ingredients was used to synthesize the expandable graphite based intumescent fire-retardant coatings designed for steel substrate. The influences of individual and various combinations of flame-retardant additives on the thermal stability and toxic emissions of the coatings were characterized by using Bunsen Burner Fire Test, Thermogravimetric Analysis, and Pyrolysis Gas Chromatography techniques. It was found that the combination of zinc borate and halloysite nano tubes (HNTs) has significantly improved the fire protection, thermal stability of the fire retardant coating formulations. The pyrolysis analysis showed that the coating added with zinc borate exhibited minimum toxic emissions due to its effective smoke suppression property. Hence, the findings from this study revealed that the selection of appropriate combinations of flame-retardant fillers strongly influenced the physical and chemical properties of the coatings.

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