Intumescent flame retardant coating based graphene oxide and halloysite nanotubes

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ABSTRACT

Epoxy nanocomposites coatings filled with hybrid graphene oxide/halloysites (GO/HNT) based intumescent flame-retardant additives (IFR) have been fabricated and investigated in terms of flame retardancy property, thermal stability, and adhesion strength. The dispersion and interaction of the nanofillers with the matrix were characterized by transmission electron microscopy (TEM) and Fourier transform infrared (FTIR). The synergistic flame-retardant effects of ammonium polyphosphate (APP) on flame retardancy properties and thermal stability were investigated by limiting oxygen index (LOI) and thermogravimetric analysis (TGA), respectively. The result shows that the epoxy coating with hybrid GO/HNT based IFR achieve an LOI of 26 % at 1 phr of APP (EGO0.6H0.3APP1). Meanwhile, the maximum mass loss of the EGO0.6H0.3APP1 coating sample is 391.0 °C which showing an increment by 1.3 % compared with neat epoxy coating, demonstrating excellent thermal stability performance. The char residue also suggests, APP played a synergistic flame-retardant mechanism with a combination of hybrid GO/HNT. The presence of hybrid GO/HNT/IFR considerably enhances adhesion strength between the coating material and metal substrate. The EGO0.6H0.3APP1 showed the maximum LOI value, thermal stability, and adhesion strength among the studied formulations.

KEYWORDS

Carbon; Coating; Intumescent; Nanoclay; Non-flammable

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