Fire retardancy effect of phosphorus-modified halloysite on polyamide-11 nanocomposites

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Description
Halloysite nanotubes (HNTs) were successfully incorporated as flame retardants in polyamide-11 (PA11) after their modification with methyl phosphonic acid. Fourier transform infrared spectroscopy, thermal gravimetric analysis (TGA) and pyrolysis–gas chromatography–mass spectrometry were used to evidence the functionalization of the clay. Raw and modified HNTs were then incorporated by melt mixing in PA11 at 20 wt%. Compositions containing both ammonium polyphosphate (APP) and HNTs were also prepared. TGA and pyrolysis combustion flow calorimeter exhibited enhancement in thermal stability upon incorporation of both raw and modified halloysite nanotubes while APP causes degradation at lower temperature. Cone calorimeter data showed that modified halloysite acts by forming an insulating barrier during the combustion, which limits heat and mass transfers. Moreover, elemental analysis of …