Polyethylene Flame Retarded with Expandable Graphite and a Novel Intumescent Additive

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Abstract

A novel intumescent additive was synthesized by neutralizing 3,5-diaminobenzoic acid hydrochloride salt with ammonium dihydrogen phosphate. This compound, which melts at 257°C, decomposes concurrently to release carbon dioxide gas. The flame retardant performance of this compound as a primary fire retardant and in combination with expandable graphite (EG) was evaluated by cone calorimetry. Cone calorimeter results showed that addition of 10 wt % EG alone lowers peak heat release rate (pHRR) of carbon black-pigmented polyethylene from 710 ± 109 to 342 ± 15 kW m⁻², whereas addition of 27 wt % of the novel intumescent lowered it to 400 ± 16 kW m². Combinations of these two additives were able to decrease the pHRR even further. Furthermore, the novel intumescent additive reduced the flame out time from 773 ± 307 to 537 ± 69 s although all other EG containing samples increased it.