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Cone calorimeter study of polyethylene flame retarded with expandable graphite and intumescent fire-retardant additives

Hermanus Joachim Kruger¹, Walter Wilhelm Focke¹, Washington Mhike¹, Albertus Taute¹, Albert Roberson¹ and Osei Ofosu²

¹SARChI Chair in Carbon Technology and Materials, Institute of Applied Materials, Department of Chemical Engineering, University of Pretoria, Hatfield, South Africa

²Polymers and Composites Competence Area, CSIR Materials Science and Manufacturing, Port Elizabeth, South Africa

Abstract

Polyethylene was flame retarded with two intumescent-type additives, 3,5-diaminobenzoic acid phosphate and ethylenediamine phosphate, which differ with respect to their decomposition onset temperatures, along with varying ratios of two grades of expandable graphite, also differing with respect to their onset temperatures for exfoliation. Hot-pressed sheet specimens were subjected to evaluation in a cone calorimeter. Although the best char yields were obtained with formulations containing the higher decomposition temperature intumescent, 3,5-diaminobenzoic acid phosphate, the overall best performance was realized using the lower decomposition temperature intumescent, ethylenediamine phosphate, when compounded together with the low exfoliation temperature expandable graphite. These results are attributed to the formation, at the burning surface, of a more cohesive char with better thermal and mass transfer barrier properties.