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B. Rimez, G. Van Assche, S. Bourbigot, H. Rahier

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Modelled decomposition kinetics of flame retarded poly(vinyl acetate)

B. Rimez[1], G. Van Assche[2], S. Bourbigot[3] and H. Rahier[2]

[1]Research Unit Transferts, Interfaces et Procédés (TIPs) Université Libre de Bruxelles, Avenue F.D. Roosevelt 50, 1050 Brussels, BELGIUM

[2]Research Unit Physical Chemistry and Polymer Science (FYSC) Vrije Universiteit Brussel (VUB), Pleinlaan 2, B-1050 Brussels, BELGIUM

[3]R_2Fire group/UMET – UMR CNRS 8207, Ecole Nationale Supérieure de Chimie de Lille (ENSCL), Avenue Dimitri Mendeleïev – Bât. C7a, CS 90108, 59652 Villeneuve d'Ascq Cedex, France

Abstract

Previously determined degradation mechanisms of a model polymer compound, poly(vinyl acetate) (PVAc), blended with two different flame retardants, ammonium poly(phosphate) (APP) and melamine isocyanurate (MIC), were used for reaction rate parameter optimization using a kinetic modeling and simulation software. Rate parameters for all different decomposition reactions were established for inert and oxidative conditions, giving insight into all interactions between flame retardants and polymer. Analyzing kinetic data, it was found that APP catalyzes the deacetylation reaction of PVAc, independent from the mixing ratio, and has a higher catalyzing effect than oxygen. Down to ten parts APP per one hundred parts of PVAc, APP is also a very efficient crosslinker with PVAc upon decomposition. MIC on the other hand acts in two ways: as heat-sink flame retardant during deacetylation and charring of the polymer, whereas during this charring step, another part of