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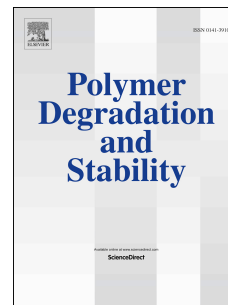
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Fire-resistant natural fibre-reinforced composites from flame retarded textiles

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Abstract

Thermoplastic composites were prepared by melt pressing fabrics from commingled natural (flax) –thermoplastic (polypropylene (PP) and poly lactic acid (PLA)) polymeric fibres. Fabrics were treated with a number of commercial flame retardants (FRs) used for textiles prior to composite preparation. Their flammabilities and mechanical performances have been evaluated in terms of FR types effective on each fibre type. The fire performances of the composite laminates evaluated using UL-94 showed that flax/PP control and all flame retarded composite samples failed the UL-94 test, except for one treated with organophosphonate FR. On the other hand all flame retarded flax/PLA samples achieved V0 rating. Cone calorimetric results obtained at 35 kW/m² also showed that all FRs significantly reduced the flammability of the composites and that their efficiencies were more pronounced in flax/PLA than in flax/PP composites. The mechanical performances of composites evaluated in tensile, flexural and impact modes indicated that all flame retardants reduced the mechanical properties of the composites, with the extent of reduction dependent on the pH of the flame retardant solution used. The reduction in mechanical properties was more severe in flax/PLA composites than in flax/PP composites.

Key words: Natural fibre-reinforced composites, polypropylene, polylactic acid, flax fibre, UL-94, flammability, cone calorimetry.

Introduction

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