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Synthesis and flame retardant efficacy of hexakis(3-(triethoxysilyl)propyloxy)cyclotriphosphazene/silica coatings for cotton fabrics

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Abstract

The development of novel flame retardants for cotton textiles that form a stable layer on the textile fiber is of high economical and practical relevance. Hexakis(3-(triethoxysilyl)propyloxy) cyclotriphosphazene has been synthesized in this work as a novel flame retardant capable of bonding to cotton fiber surface. This is the first report on the application of hydrosilylation to synthesis of triethoxysilyl cyclophosphazene derivative. The flame retardant properties of treated cotton textiles were assessed by measuring heat release rate on a pyrolysis-combustion flow microcalorimeter and determining the limiting oxygen index, whereas the thermal stability was studied by thermogravimetry. The modified fabrics were characterized by SEM-EDS analysis and surface morphology. The influence of the preparation methodology of the coating on the flame retardant performance and thermal stability are discussed.

Keywords: phosphazene compounds, flammability, cotton, coating, silica

1. Introduction

Natural fibers and fabrics have found a wide application in many areas of life due to their unique mechanical properties. They are commonly used as fillers in biocomposites as well as in the apparel, textile and upholstery industries. Natural textiles, despite their advantages,

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