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Communication

## The flame retardancy of alginate/flame retardant viscose fibers investigated by vertical burning test and cone calorimeter

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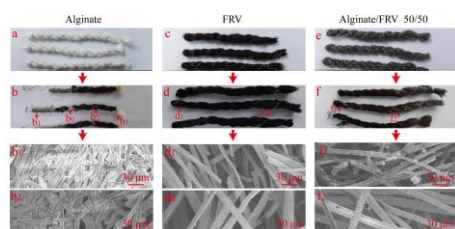
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### Graphical Abstract



The smoldering weakness of alginate fibers can be effectively suppressed by simple blending with flame retardant viscose fibers. The char formed by flame retardant viscose fibers can prevent the heat transmission and suppress the smoldering of alginate.

### ABSTRACT

In this research, the flame retardancy of neat alginate fiber, flame retardant viscose fiber (FRV) and alginate/FRV (50/50) blending fibers were investigated by vertical burning and cone calorimeter tests. The vertical burning test showed that the afterflame time of alginate fiber was 0 s, but alginate presented serious smoldering behavior with the afterglow time of 605 s and damaged length of 85 mm, while the afterglow time of FRV was 0 s. When the FRV was incorporated into alginate with the weight ratio of 50/50, the afterglow time and damaged length were significantly reduced to 85 s and 35 mm, indicating the smoldering of alginate can be effectively decreased. The morphology and chemical structure of the alginate residual demonstrated that it was seriously destroyed during smoldering process, which was ascribed to its relative low initial thermal degradation temperature. Based on the thermal properties analysis, alginate and FRV fibers shared the concurrence of rapid degradation in the same temperature region of 250-300 °C, through which, the compact and stable char formed by FRV can prevent the heat transmission and suppress the smoldering of alginate. Further, the cone calorimeter results demonstrated that the time to ignition (TTI) significantly increased and peak heat release rate (PHRR) decreased for alginate/FRV (50/50) compared with FRV. With this research, a new method to overcome the smoldering of alginate was proposed by blending with FRV.

Keywords:

Alginate fibers

Flame retardant viscose fibers

Blending

Flame retardancy

Vertical burning test

Cone calorimeter

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