



Abstract

Insights on Passive Fire Protection of Wood Materials in Use at Wildland–Urban Interface: Case of Intumescent Coatings [†]

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Wood materials used as furniture or construction at WUI constitute a hazard in case of wildfire exposure. Structure elements may act as spread vectors from the wildland to the housings leading to security issues. In a context of on-going increasing risk, fire proofing of materials becomes a leading problem in terms of fire safety concerns. Fire retardants are classified following their thermal behavior and action mechanisms. Among these, intumescent coatings constitute an innovative way to protect substratum using a synergistic effect leading to the formation of a carbon-rich protective layer. This effect is based on the polymerization of a carbon source with an acid source when exposed to heat flux [1]. A blowing agent releasing inert gases (water, carbon dioxide) can be added to provide better expansion of the char layer [2].

The aim of this study is to define and measure the thermal ability of a newly formulated intumescent mixture at bench scale by using cone calorimeter and thermogravimetric analysis. This formulation contains natural extracts obtained by pressure-assisted method using “green” solvents (ethanol, water and mixtures of both). Measurements of total polyphenol content (TPC) and antioxidant capacity (ORAC) were conducted and indicated high polyphenols and tannins concentration, both showing good capabilities as a carbon source [3,4]. Extracts were then selected following tests carried out with a thermogravimetric analyzer based on char residue at 900 °C and the temperature of maximal decomposition under nitrogen and air flow.

Different ternary formulations shaped into pellets were tested with a cone calorimeter at 50 kW.m⁻² irradiance without forced ignition. Physical properties measurements were conducted, including expansion coefficient of char layer (determined by image processing). Samples showing the best results might allow, in further work, the elaboration of a new natural-based intumescent coating for wood materials that might be used at WUI to provide better fire protection for dwellings.

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