Structural and Flammable Attributes of Monoammonium Phosphate and Sodium Tetraborate Pressure Treated Wood Phase III

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Wood is a common building material due to its wide availability, light-weight properties, and strength under stable conditions. However, a major susceptibility is in its inability to withstand fires, oftentimes exacerbating their severity. Applying Monoammonium Phosphate (MAP) and boron-based compounds to the surface of the wood have been marginally effective fire retardants. They increase the amount of time needed to ignite the wood and decrease the overall burn time. This study investigated whether MAP and boron-based products infused into wood further improve retardancy while also assessing the structural integrity of the wood post-treatment. Boron and phosphate based powders were individually and combinatorially mixed with water or alcohol to form a chemical carrier. A vacuum chamber was used to infuse solutions deeper into wood. Samples were subsequently air dried and burned to assess ignition and overall burn time. Following treatment, wood samples were stressed to determine the impact chemical treatment had on structural integrity. Time and integrity data were analyzed by ANOVA and T-Tests, respectively, and found that a combination of MAP and sodium tetraborate in water carriers increased ignition time of the wood while shortening the burn time. Wood with an ethyl alcohol carrier or MAP had equivalent ignition times and shorter burn times when compared to untreated wood. The null hypothesis was supported for structural integrity indicating treated wood held up to stress similarly as untreated wood. Thus, this study suggests a combination of both MAP and boron-based products, carried in water, to be an effective fire retardant.

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