

EXPERIMENTAL STUDY ON FIRE RESISTANCE PERFORMANCE OF CHEMICALLY TREATED WOOD

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Abstract

Wood is used in residential and non-residential constructions and constitutes a potential hazard for people and environment in case of fire. Wood mainly consists of cellulose, hemicelluloses and lignin which undergo pyrolysis upon heating and results in vigorous production of flammable volatiles. Certain minerals like phosphorous, bromine etc. in the wood increases char formation rate and reduces the liberation of volatile flammable gases. The charring rate and flame speed are the two parameters which determine the fire resistance of a particular wood species. Also loss of weight due to oxidation is a parameter which determines the particular wood's ability to retain its strength during fire happens. The wood species Pericopsis Elate which is commercially used for making furniture and structural member, is used in this project for treating it with chemicals such as mono ammonium phosphate, ammonium sulfamate, ammonium bromide and boric acid. The specimens are heated with constant heat flux using a resistance heater and char formation rate in both longitudinal and transverse grain direction are measured. With the help of flame torch, a constant flame is subjected to one end of the fresh specimen and measured the travel time of flame for a particular distance on the specimen in order to find the flame speed. The powdered specimen is then tested in TGA to carry out thermal analysis of treated wood. The same experiment is also carried out with untreated wood specimen to compare the fire resistance performance of treated wood.

Keywords: ignition, pyrolysis, charring rate, flame speed, oxidation, fire, Thermo-gravimetric analysis.