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Study on flame retardant properties of carbon nano-angle-based composite flame retardants for wood

Manman Xue [1, 2], Jie Xu [1, 2], Yixin Zhang [1, 2], Jianjun Wu [1, 2, *]

[1] *School of Chemical Engineering and Technology, China University of Mining and Technology, Xuzhou 221116, China*
[2] *National Engineering Research Center of Coal Preparation and Purification, China University of Mining and Technology, Xuzhou 221116, China*

Abstract

This work will study the compounding of a new type of carbon nanomaterial, single-wall carbon nano angles (SWCNHs), potassium carbonate and lignin, to obtain a composite flame retardant that efficiently reduces the flammability of wood fibers. The wood was first divided into a control group (Natural wood) and a delignin group (Delig-wood), and then the flame retardant composed of SWCNHs and potassium carbonate (K_2CO_3) composed of pre-adsorbed alkali lignin was deposited into the outer surface of the wood by vacuum impregnation, so that the wood had good thermal stability and fire resistance. Compound flame retardants were prepared by adding 0.15% SWCNHs, 1% alkali lignin and 1% potassium carbonate, and the results of the conical calorimetry experiment showed that the first maximum heat release rate pk_1-HRR and the second maximum heat release rate pk_2-HRR of Delig-wood/SWCNHs decreased by 37.59% and 25.07% respectively compared with the peak of the log, and the total exorcism decreased by 55.71%, and the total smoke production (TSP) decreased by 59.81%, respectively. And the rate of carbon monoxide production (COP) decreased significantly by 74.02%. Thus, the compounding of carbon nano angle and potassium carbonate can be obtained to reduce the heat release rate and total exothermic heat of wood, reduce the generation of smoke and CO, and effectively improve the flame retardant and smoke suppression performance of wood.

Exothermic results

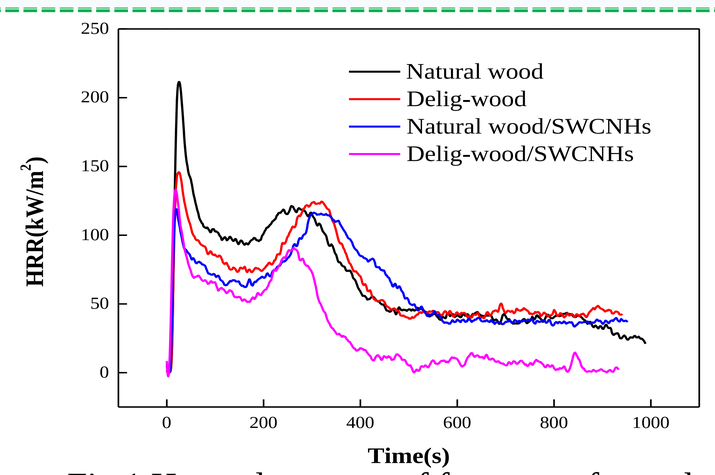

Fig.1 Heat release rate of four sets of samples.

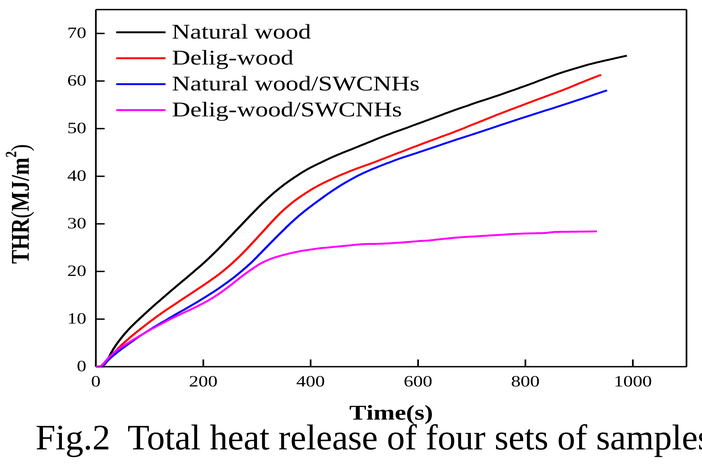

Fig.2 Total heat release of four sets of samples.

Smoke release results

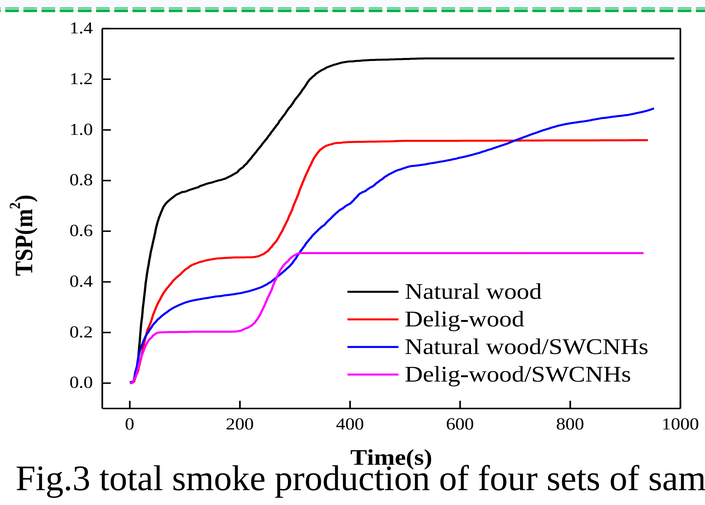

Fig.3 total smoke production of four sets of samples.

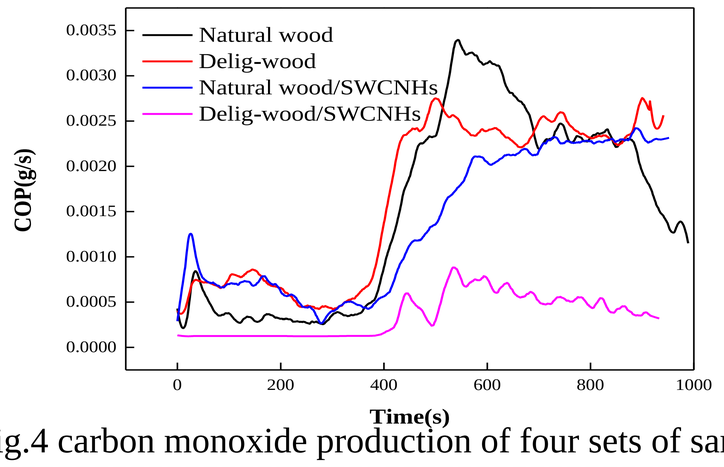

Fig.4 carbon monoxide production of four sets of samples.

References

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