第二届中德国际会议论文摘要模板（篇幅可为1-3页）

Effects of Time-Dependent Heat Fluxes on Pyrolysis and Spontaneous Ignition of Wet Wood

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# ABSTRACT

This work investigates experimentally and theoretically the effects of time-dependent incident heat flux (HF), which is more reasonable in fire-like environment, on thermal degradation process of wet pine wood. A feedback method was utilized to generate a time-dependent HF by controlling the output power of radiative heater, namely *q*in*=αtβ*, and both quadratic and linear heat fluxes are focused in this study. Comparison between the measured varying heat fluxes and designed values indicates that this method provides high accuracy necessary. Measurements of mass loss rate, temperature distribution at different depths of material and ignition time were implemented in the tests to examine the influence of time-dependent heat fluxes. The results showed that the mass loss rate is affected significantly by the changed heat flux compared with constant scenario. The critical mass flux, which keeps almost unchanged, can be employed as the ignition criterion due to the fact that the ignition temperature increases with increasing HF, which also certifies the conclusions of other researchers. The heat penetration layer is restricted to a thinner depth with larger *α* and *β*. A simplified theoretical model is used to predict the surface temperature before ignition and good agreement exists between the experimental and theoretical results. Furthermore, a linear relationship was found between ignition time and *α*−2/(1+2*β*), which is also validated by the experimental data and is reexamined by the constant circumstance.

This work investigates experimentally and theoretically the effects of time-dependent incident heat flux (HF), which is more reasonable in fire-like environment, on thermal degradation process of wet pine wood.Comparison between the measured varying heat fluxes and designed values indicates that this method provides high accuracy necessary. The results showed that the mass loss rate is affected significantly by the changed heat flux compared with constant scenario. Measurements of mass loss rate, temperature distribution at different depths of material and ignition time were implemented in the tests to examine the influence of time-dependent heat fluxes. The results showed that the mass loss rate is affected significantly by the changed heat flux compared with constant scenario.

**Keywords:** Time-dependent heat flux, pyrolysis, wood, ignition time.

# ACKNOWLEDGMENT

This research was supported by National Natural Science Foundation of China (No: 51506081), Natural Science Foundation of Jiangsu Province (No: BK20150954) and The Open Fund of the State Key Laboratory of Fire Science (SKLFS) Program (HZ2015-KF09). The authors deeply appreciate the support.

**Reference**

1. Babrauskas, V. Ignition Handbook, Fire Science Publishers, 2003.
2. Di Blasi, C. Modeling and Simulation of Combustion Process of Charring and Non-Charring Solid Fuels, Progress in Energy and Combustion Science, 19(1): 71-104, 2003.