RESPONSE FROM AUTHORS

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We thank Dr Jones for his comments.

In the 3rd page, first paragraph of section 4.1, it is clearly stated that “Ignition did not happen to all the specimens during the heat exposure.” On the other hand, it is impossible for burning processes to last more than one month. Common misunderstandings about ignition include:

1. There are two types of ignition, smoldering ignition (or glowing ignition) and flaming ignition. Smoldering combustion was defined by Ohlemiller [1] as self-sustaining, propagating exothermic reaction wave deriving its principal heat from heterogeneous oxidation of the fuel. According to Ignition Handbook written by Babrauskas [2], ignition is commonly manifested first as smoldering when a porous or granular substance undergoes self heating. And Gratkowski et al. [3] mentioned that, low heat flux is sufficient to char the surface and to heat the interior to the point that oxidation of the char may lead to smoldering ignition. At medium or higher heat fluxes the smoldering may lead to flaming ignition and even direct flaming ignition. It is clear that under specific temperature wood block will go through smoldering ignition first, then it may turn to flaming ignition when critical conditions are reached. Flaming ignition is defined by Rein [4] as an exothermic oxidation reaction that takes place in the gas phase not in deep side of a wood block, so the oxygen diffusion Dr Jones mentioned is not an issue for the flaming ignition.

Eq. (1) isn’t intended to predict flaming ignition time of woods or other solids in oven furnace. It aims to show that the flaming ignition can be considered to happen when ignition temperature is reached. As defined by Rein [4], flaming ignition is an exothermic oxidation reaction that takes place in the gas phase not in deep side of a wood block, so the oxygen diffusion Dr Jones mentioned is not an issue for the flaming ignition.

There is no comparison between wood block in this paper and other wood products mentioned by Dr Jones. Ignition temperature, thermal conductivity, density, specific heat capacity, surface emission and experimental conditions vary among these solids. So there is no direct connection between the ignition of wood block and other products.

2. Flaming ignition can be considered to happen when surface temperature reaches ignition temperature, no matter what kinds of solids including sawdust, wood chips, and wood fibre insulation products. According to Carslaw and Jaeger [6], flaming ignition time can be predicted by:

\[ t_{ig} = \frac{\pi}{4} \frac{\lambda}{\rho C_p} \left( \frac{T_{ig} - T_0}{\varepsilon q^*} \right)^2 \]  

(1)

where \( t_{ig} \) is the ignition time; \( \lambda \) is the thermal conductivity; \( \rho \) is the density; \( C_p \) is the specific heat capacity; \( T_{ig} \) is the ignition temperature; \( T_0 \) is the ambient temperature; and \( \varepsilon \) is the surface emission; and \( q^* \) is the external heat flux.

As mentioned in the 2nd objective, this paper is trying to investigate woods’ propensity to self ignition under low temperature in a long duration. This doesn’t mean that flaming ignition happened during experiments. This paper is significant as it has investigated...
pyrolysis characteristics and potential risk of smoldering ignition for building materials under low temperature in a long duration. Time to reach final weight under low temperature can be predicted by this model. This paper has provided a useful tool to evaluate damage of building materials under potential heat sources.

REFERENCES