

Experimental Investigation on the Fire Performance of Corrugated Sandwich Panels made from Renewable Material

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Abstract : The use of renewable substitutes in various semi-structural and structural applications has experienced an increase since the last few decades. Sandwich panels have been used for many decades, although research on understanding the effects of the core structures on the panels' fire-reaction properties is limited. The current work investigates the fire-performance of a corrugated sandwich panel made from renewable, biodegradable, and sustainable material, plywood. The bench-scale fire testing apparatus, cone-calorimeter, was employed to evaluate the required fire-reaction properties of the sandwich core in a panel configuration, with three corrugated layers glued together with face-sheets under a heat irradiance of 50 kW/m^2 . The study helped in documenting a unique heat release trend associated with the fire performance of the 3-layered corrugated sandwich panels and in understanding the structural stability of the samples in the event of a fire. Furthermore, the total peak heat release rate was observed to be around 421 kW/m^2 , which is significantly low compared to many polymeric materials in the literature. The total smoke production was also perceived to be very limited compared to other structural materials, and the total heat release was also nominal. The time to ignition of 21.7 s further outlined the advantages of using the plywood component since polymeric composites, even with flame-retardant additives, tend to ignite faster. Overall, the corrugated plywood sandwich panels had significant fire-reaction properties and could have important structural applications. The possible use of structural panels made from bio-degradable material opens a new avenue for the use of similar structures in sandwich panel preparation.

Keywords : corrugated sandwich panel, fire-reaction properties, plywood, renewable material

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