ABSTRACT

The research investigated the fire performance of selected local hardwood species and reconstituted wood-based boards in a cone calorimeter, BS and ASTM furnace. Samples in cone were exposed to incident heat fluxes of 50 kW/m$^2$ while BS and ASTM furnace samples were subjected to the standard temperature-time curve, with the former under 20Pa positive pressure and the latter under atmospheric. Charring rates, char contraction factors, char yield and char density were computed. The results derived compared favorably with established benchmarks.

The research also studied the degradation processes and changes in the thermal properties through the use of thermal analysis in both inert and oxidative environments: thermogravimetric analysis and differential scanning calorimetry. The research found that peak positions and assignment of peaks for wood and wood-based boards except wood-based boards lacked the shoulder corresponding to the degradation of hemicellulose.

The thermal analyses indicated that degradation at molecular level were very similar for both wood and wood-based boards. However, no direct comparisons between thermal analyses and charring rates were possible. The study identified the missing links and proposed a framework linking together weight losses and thermal properties from thermal analysis to a heat transfer simulation model so as to predict charring rates such that direct comparisons would then be permissible to that of cone, BS and ASTM furnace.