

Fire behavioural and mechanical properties of carbon fibre reinforced aluminium laminate composites for aero-engine

ABSTRACT

Two different properties of fibre-metal laminate composites (FML), including the fire behaviour and mechanical properties, were experimentally studied in this paper. The fibre-metal laminate composites studied were made of aluminium alloy 2024-T3, carbon fibre, flax, kenaf and epoxy resin/hardener arranged in different forms. The aims of the study are to assess the fire behaviour of the composites using ISO2685 standard and mechanical properties of the composite after withstanding the burn-through according to the standard. The fire test was carried out using ISO2685 standard using a propane-air burner, whereby the propane gas and air serves as the fluid to the system. The universal testing machine of the 100 kN load cell and gun tunnel were used for the mechanical properties test according to each test standard. The fire results showed that three of the FML composites considered in the study are fireproof composites while carbon fibre kenaf reinforced aluminium laminate (CARALL4) is a fire resistant composite. Carbon fibre reinforced aluminium laminate with aluminium alloy at the front and the rear face (CARALL2) withstood higher flame temperature than the other FML composites with 14.4%, 49.0% and 82.8% greater than CARALL1, CARALL3 and CARALL4 in terms of thermal conductivity. In terms of mechanical properties, it was also CARALL2 that has higher tensile, compressive, flexural and impact strength. Therefore, the study showed that carbon fibre flax reinforced aluminium laminate (CARALL3) which is the hybrid composite with green fibre can compete with fibre-metal laminate composites of pure synthetic fibre in terms of their properties.

Keyword: Composite; Fibre metal laminate; Fire designated zone; High temperature; Mechanical properties

