

Carbon fiber-reinforced epoxy composites with improved flame resistant and electrical conductivity

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The growing demand for fiber-reinforced polymer composites for the manufacture of internal and external aircraft structural elements results in the fact that, in addition to their excellent mechanical strength, they are also required to have properties that minimize adverse effects from lightning strike. The aim is to achieve good electrical conductivity, ability to shield against electromagnetic radiation fields and flame resistance [1-4].

The objective of the present study was to investigate the influence of the addition of liquid flame retardants and conductive fillers on the mechanical properties, flame resistance, electrical conductivity and lightning resistance of carbon-fiber reinforced epoxy composites. For this purpose, the carbon fiber-reinforced epoxy composites containing additives were prepared by infusion method. The content of flame retardants didn't exceed 25% by weight, while the amount of conductive additives ranged from 0.1-5% wt. [5]. For the obtained composites, the lightning strike resistance was performed during high-current mode test on a suitably prepared test stand. The generator charging voltage was set to 40 kV. The flammability and mechanical properties of composites were also carried out. On the basis of the obtained results it was found, that the addition of 25% wt. of flame retardants results in V0 class by UL94 instead of HB40, the limiting oxygen index LOI = 24.6% instead of 19.2% and peak of heat release rate pHRR = 145.2 kW/m² instead of 340.6 kW/m². In turn, the best lightning strike resistance and mechanical properties were characterized by a composite containing 0.5% wt. conductive carbon black.

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