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IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Specialised Technologies, Including Nanotechnology (8)

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FEASIBILITY AND SPONTANEITY OF GEOPOLYMERS FOR POTENTIAL AEROSPACE APPLICATIONS

Abstract

The paramount constraints to expedite advancements in aerospace sector, which entails formidable operating values for Flight speeds, temperatures and stresses encountered, are the properties of material being cast-off. Due to the incessant threats involved, high strength-to-weight ratio is obligatory in construction of aerospace structures. Fibre Reinforced Plastics comprises of high strength fibres and polyester/epoxy resin as its binding matrix and properties that are dependent on the concentration and orientation of fibres in it. Generally organic FRPs are witnessed to have inherent inability to withstand high temperatures, hence FRPs with carbon fibres in particular concentrations have been utilised as a heat shield material in the space propulsion vehicles. The major issues involved with the conventional FRPs are that they are not usually fire resistant and also the presence of carbon fibre increases the cost. However, since last four decades researchers have been formulating various compositions of inorganic polymers by replacing Carbon with Silicon, called Geopolymers exhibiting elevated thermal and fire impedance. Recent noble Geopolymeric synthesis technique uses Fly Ash and Ground Granulated Blast Furnace Slag (GGBS) in Sodium/Potassium Silicate activator solution forming Sodium-Alumino-Silicate inorganic polymers with better binding properties. The FRPs corroborating Geopolymers is termed as Fibre Reinforced Geopolymer (FRGP) composite. The current work emphases on improving existing fibre content by diminishing fibre size from Microns to Nano level and testing the feasibility of Pineapple Leaf Fibre (PALP) and industrial grade Banana Fibres. The conventional method for preparation of resin has also been modified as the reagents are now mixed in the liquid state to ensure efficient matrix is formed and thereby manufacturing laminates, which are profoundly tested under several laboratory conditions. The experiments are validated for concerned remodelled material properties for aerospace implications which include replacement of rocket components with affordable Geopolymers, wherever needed. The material's immense potential can be exploited in space colonisation missions, which demand sturdy constructions indeed. This composite could be revolutionary by prevailing in numerous adverse practical engineering applications.