

Thermal Resistance Analysis of Flexible Composites Based on Al₂O₃ Aerogels

Authors : Jianzheng Wei, Duo Zhen, Zhihan Yang, Huifeng Tan

Abstract : The deployable descent technology is a lightweight entry method using an inflatable heat shield. The heatshield consists of a pressurized core which is covered by different layers of thermal insulation and flexible ablative materials in order to protect against the thermal loads. In this paper, both aluminum and silicon-aluminum aerogels were prepared by freeze-drying method. The latter material has bigger specific surface area and nano-scale pores. Mullite fibers are used as the reinforcing fibers to prepare the aerogel matrix to improve composite flexibility. The flexible composite materials were performed as an insulation layer to an underlying aramid fabric by a thermal shock test at a heat flux density of 120 kW/m² and uniaxial tensile test. These results show that the aramid fabric with untreated mullite fibers as the thermal protective layer is completely carbonized at the heat of about 60 s. The aramid fabric as a thermal resistance layer of the composite material still has good mechanical properties at the same heat condition.

Keywords : aerogel, aramid fabric, flexibility, thermal resistance

Conference Title : ICMET 2018 : International Conference on Materials Engineering and Technology

Conference Location : Stockholm, Sweden

Conference Dates : July 12-13, 2018