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MATERIALS AND STRUCTURES SYMPOSIUM (C2)
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THERMO-STRUCTURAL AND ELECTROMAGNETIC STUDY SIC AND CARBON FOAM FOR ADVANCED SPACE SYSTEMS.

Abstract

To permit an airframe sandwich construction to perform satisfactorily, such as in the case of thermal protection systems, the core of the sandwich must have certain mechanical properties, thermal characteristics, and dielectric properties under conditions of use and still conform to weight limitations. The aim of this paper is to study the properties of ceramic foams such as SiC and Carbon foams for sandwich structures of advanced space systems, for example thermal protection systems, which operates at high temperature working conditions. The typical sandwich panel consists of strong outer laminate skins made with oriented glass, carbon or aramid fiber and a lightweight inner core. Tailoring foam core selection to the specific application is especially important. When failure of a sandwich panel occurs it is usually in the core, because plastic foams have low shear rigidity compared to the skins. The core material must be strong enough to stabilize the sandwich structure, providing a shear load path between the laminate skins to prevent buckling. The physical properties of the foams are dependent on the type, quality, and treatment of the precursor. For this reason thermo-mechanical tests of ceramic foams are studied. Thermo-mechanical characteristics of foams are analysed also with numerical simulation in order to guarantee the structural integrity at room and high temperatures. This will enhance the use of foams for thermal protection systems with a pre-selection which is here presented. Users could use this study for a pre-selection for the development of thermal protection systems, debris shields and aerospace sandwich structure in general. As the materials are thought to be used for space applications, the behaviour of the materials is studied under space environment conditions such as outgassing and atomic oxygen tests. These tests will allow to understand if the structure could be compliant to the environment. With the development of space structures many factors have to be considered, as it is well known, space vehicles are affected by electromagnetic interferences which led to disturbances on telecommunication, tracking and telemetry systems. These interferences must be limited in order to guarantee the success of the space mission. For this reason, in this work the characterization of electromagnetic shielding of the foams is presented.