



Centro Italiano Ricerche Aerospaziali

Summary:

invention relates to a method of making a passivating coating based on silicon compounds on a carbon fiber-reinforced ceramic matrix composite.

Benefits:

Eliminate, or at least reduce, the problems of the classic techniques of coating deposition (by means of CVD or PVD) by providing a method that gives the possibility to create the coating in conditions of non-high vacuum and in the absence of dangerous gases.

Method of making a passivating coating on a ceramic or fiber-reinforced ceramic

Problem addressed:

Carbon-based ceramics, C/C or CMC are naturally prone to oxidation at high temperatures. These materials are used for numerous industrial and aerospace applications where oxygen is present in the operating environment. In order to protect the material from attack by molecular and/or atomic oxygen, it is necessary to use a passivating coating.

Proposed use:

Manufacturing of complex structural parts of space systems and aircraft (turbine blades, aircraft wings or flaps, thermal protection systems in general, pistons for engines, etc.) using long-fiber reinforced composite materials. In addition, there are also potential opportunities for exploitation in the industrial sector (crucibles and kiln of furnaces).

Technology overview:

The invention relates to a method of making a passivating coating based on silicon compounds on a carbon fiber-reinforced ceramic matrix composite. The method consists in exposing the component to silicon vapors which, reacting with the carbon on the surface, generate a protective layer of SiC that is well adhered to the substrate with a dendritic structure.

Reference project:

The technology was developed within the framework of the ProRa SHS project and applied in the thermal protection system and control surfaces of Space Rider of which CIRA is the Design Authority.

Intellectual property information:

Italian Patent n. 102019000016382 granted on 24.08.2021.
PCT/IB2020/058604 filed on 16.09.2020 (Europe, Israel, China, US).
Patents are owned by CIRA SCPA and Petroceramics SPA.

CIRA inventors:

Mario De Stefano Fumo: m.destefanofumo@cira.it
Giuseppe Rufolo: g.rufolo@cira.it
Roberto Gardi: r.gardi@cira.it
Stefania Cantoni: s.cantoni@cira.it