



G. Pouget, A. Fernandez-Lopez, A. Guemes, J.C. Ehrstrom

Integrated Optical Fibers into Aluminum Extrusions Enabling Structural Health Monitoring of Aerospace Structures

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Structural Health Monitoring (SHM) enables the detection of damage via sensors that are placed within or onto the structures. SHM technologies are especially considered for the next generation aircrafts as it could reduce maintenance costs and enable significant weight savings by revolutionizing the current aircraft design approach and guaranteeing that a structure is damage-free. Constellium believes that SHM enabling aluminum parts would contribute to such improvements for metallic aerostructures and has thus produced extruded semi-products containing integrated wire-shaped sensors. Optical fibers which are particularly relevant sensors for SHM have been integrated within aluminum extrusions and tested to assess the SHM potential and the feasibility of such a solution. Fatigue crack propagation tests have then been performed, monitoring the optical signal through the optical fibers in parallel. It is demonstrated that a crack can be detected using such embedded optical fibers. Depending on the sensor type it can be used to verify the integrity of the extrusion or to provide more complex information such as the strain, or the damage position, along the extrusion's length. This could be of particular interest for aircraft areas designed in damage tolerance such as the lower wing or the upper fuselage, and enable to change the damage tolerant scenarios.

Ключевые слова:

Содержание.

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