

Title: Properties of the ceramic-polymer composites used in aviation

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Summary:

PhD thesis titled: Properties of the ceramic-polymer composites used in aviation was taken to develop and study selected properties of composite materials with an infiltrated network structure, characterized by the specific functional and mechanical properties, which forming a new construction and finishing materials for the aerospace industry and related industries.

The motivation to undertake research in this area was research the lightweight, tough and fire-resistant composite materials, as well as the need for develop a sound-proofing materials.

As part of the work, an analysis of the current state of knowledge about ceramic-polymer composites, as well as their individual components (ie. ceramic foams and epoxy resins properties), and experimental and analytical studies of manufactured composites were carried out. The particular attention was focused on the mechanical properties, fire resistance and acoustic damping of composites, which satisfactory experimental values allow to application these kind of materials, ranging from single elements to advanced units, for example an acoustic barriers in the cockpit of helicopter, as well as bearing walls which reduce the noise of working equipment.

The preparing process of this type of composites was preceded by made an alumina foams with a specified geometrical structure by gel-casting method. An alumina foam were characterized by the low density, high compressive strength such this type of material and fire resistance, which is the main aspect of the technical possibilities of their use in the aerospace industry. The obtained alumina foams as matrixes of the composites were impregnated with selected epoxy resin with specific physical and mechanical properties in the vacuum infiltration process in order to obtain the final products with improved mechanical and functional properties.

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