Evaluation of the Optical Properties of Fibrous Structure Materials for Thermal Protection of Radio-Transparent Aircraft Surface Domains

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High-speed aircraft require radio communication with the ground. Here, a high speed sets a high level of thermal loads and temperature, thus requiring creation of the surface domains in their skin that are capable of maintaining radio transparency while heated to 2000–2500 K with maintaining a sufficient thermal protection level. Of the greatest interest is silica (SiO_2) in the form of fibers, 1–10 μm in diameter, applied as a raw stock to produce either a material such as the cotton wool, or to make bundles, 0.5–1.5 mm in diameter: their 2- or 3-dimensional weaving with the silica aerosol space impregnation between them (and between the fibers) forms the lightweight, high-temperature, heat-resistant, one-component structural material.

To assess the material behavior at high temperatures, it is sufficient to obtain the spectral dependences of the standard hemispheric reflectance and transmittance under the normal conditions (without performing high-temperature studies); and we did it using the standard measuring instruments. The obtained results of experimental evaluation of optical properties of 5 mm thick samples with two-dimensional weaving to harnesses (diameter 0.5–1.5 mm) of a fibrous silica material (average fiber diameter about 6–7 microns) structure are presented.