Radio-physical properties of radiotransparent thermal protection materials in ablation mode

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Experimental method for assessing the impact of the effects of high-temperature ablation processes on the radio physical characteristics of radiotransparent thermal protection materials (RTPM) is developed. Researches for the following RTPM with various structures of glass fillers are completed: press material (RTP-200); glass-fiber laminate (GFR-CM); reinforced quartz material (HTRC-CM) and a thin-layer thermal protection coating (TCT). The influence of physicochemical transformations in the surface layer of RTPM on transmission and reflection coefficients of electromagnetic (EM) waves and on the value of their complex permittivity is determined. It is shown that changes of modulus of transmission coefficient after the high-temperature treatment make 1–2 dB of order of magnitude in the frequency range from 2 to 40 GHz for HTRC-CM, make 4 dB no more for GFR-CM, make 14 dB no more for RTP-200 and make 25 dB no more for TCT. It is worth noting that the most significant changes of transmission coefficient are observed in the short-wave region of EM spectrum. In the total the HTRC-CM has high-level operating reliability, whereas the radio-physical properties of RTP-200, GFR-CM and TCT deteriorate.