Experimental method of estimating the quality of protective properties of composite porous stacks

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Mechanical loads of microsecond duration are a serious danger [1] for flight vehicle (FV) of various purposes. One of the best constructive means of protection is composite porous stack located on the surface of the FV. When developing this type of protection, it is necessary to determine rational parameters of the stack (set of materials and their thicknesses) that provide a given level of protection.

Numerical modeling of wave processes in modern porous materials is difficult, due to the absence of detailed data on the behavior of such materials in short-time loading. In this work, the quality of the protective properties of stack is proposed to be estimated by its ability to provide amplitude attenuation and increase the duration of the wave impulse when it propagates. To do this, time profiles of the propagating impulse are recorded at stack points located at different depths from the surface. Manganin sensors and piezoelectric film protected with organosilicon varnish are used as wave pulse recorders. Stack loading is produced by impact of the plate, which is thrown as a result of detonation of the sheet explosive. To verify the proposed method, model composite stacks with porous layers from various materials were made, it is shown for these stacks that porous layers in the form of honeycombs made of organic fabric have higher protective characteristics compared to other types of porous materials studied.

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[1] Bakulin V and Ostrik A 2015 *Complex action of radiations and particles on the thin-walled constructions having heterogeneous coverings* (Moscow: Fizmatlit)