Impact response of high-strength $(\alpha+\beta)$ titanium alloy Ti–5Al–5Mo–5V over 300–900 K temperature range

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High-strength titanium alloys of the transition class are a promising material for use in heavy-duty structures of aviation, space and military equipment due to their high specific strength and operational reliability. When studying the effects of impact, explosion, and intense pulsed effects on products, it becomes necessary to describe the processes of high strain rate and fracture of titanium alloys during impact compression. This work presents the results of measurements of the Hugoniout elastic limit and spall strength of a titanium alloy of the Ti-5Al-5Mo-5V (VT22) system manufactured by JSC VSMPO-AVISMA Corporation. One-dimensional shock compression pulses were created using an impact plate with velocities from 500 to 1900 m/s. Experimental of the free surface velocity profiles of the samples with a thickness from 0.4 mm to 10 mm were recorded using a VISAR laser interferometer. During the experiments, the maximum compression stress was varied from 4 GPa to 19 GPa. For samples in the hot-rolled state, the influence of temperature in the range from 300 K to 900 K on strength characteristics was evaluated. As a result of the analysis of the data obtained during measurements of the evolution of the elastoplastic shock compression wave, the dependences of the rate of plastic deformation on stress were determined. The values of the spall strength were also evaluated depending on the rate of deformation in the incident load pulse. The work was carried out with the financial support of the RSF project 25-29-00899 (https://rscf.ru/project/25-29-00899/).