Assessing the impact of laser-induced plasma parameters on the physical and mechanical characteristics of the surface layer

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The laser shock peening (LSP) is a method of increasing the fatigue resistance of parts. This method involves using powerful laser radiation to ablate the surface, creating high-pressure plasma that generates shock waves and causes plastic deformation. This process results in the formation of a layer of residual compressive stresses in the material. The depth and magnitude of these stresses exceed those achieved by traditional shot-peening methods by 3–4 times [1]. Numerical simulation is necessary to analyze and determine the stress-strain state of parts after each pulse in the LSP process due to its pulse-periodic nature [2]. The numerical model of the hardening process includes the description of plasma expansion in a confined regime to obtain the spatial and temporal pressure characteristic. This work compares the results of analytical models of plasma expansion with the physical and mechanical characteristics of the surface layer obtained experimentally.

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[1] Clauer A H 2019 *Metals* **9** 626

[2] Lyakhovetsky M A, Korolev D D, Kozhevnikov G D and Volkov M V 2021 Laser shock peening of VT6 titanium alloy with aluminium ABS coating *Fast-Hardened Materials and Coatings. Proc. of the XVIII Int. Scientific and Technical Conf., October 19–20, 2021* p 258