

Application of focusators of radiation to increase the efficiency of laser heat treatment and combined processing of materials

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Abstract

The application of elements of computer optics (radiation focusators) allows to create the spatial distribution of the power density of energy flows required for the technological processes of laser thermal and combined treatment of materials. In order to generate radiation from technological CO₂ lasers, an optical device has been developed that contains a moving element of computer optics and a deformable concave reflector. The laser thermal and combined treatment operations are automated with the ad hoc hardware and software, integrated into the laser technological complex LK-1300 "Hebr-1A". An analysis of the results of experimental studies indicates the expediency of using technological optical systems based on radiation focusators during laser annealing of low-alloy titanium alloys and thermal hardening to increase the wear resistance of steel parts operating under friction conditions. A simulation model of the formation of temperature fields in technological objects during plasma-laser coating has been built. The thermal effect of combined energy flows on materials have been analyzed. The calculated values of temperatures for the selected group of materials in wide ranges of movement speed and power of the heat source are in satisfactory agreement with the results of the experimental estimate (error $\delta_e \leq 15 \dots 20\%$).

Keywords: focusator, laser heat, computer optics, radiation focusator, optical device, deformable concave reflector, Hebr-1A, plasma-laser coating.

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[Access full text \(in Russian\)](#)

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