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LASER ALLOYING OF TITANIUM ALLOYS WITH B AND TiB_2

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Titanium alloys are known to possess unique properties: high specific strength and high corrosion resistance, but their wear resistance is not well enough. In order to improve it various technologies have been used including laser hardening. The most effective type of laser hardening to increase wear resistance of materials is known to be laser alloying. In this paper the results of laser alloying of titanium alloys with B and TiB_2 are presented. These substances have been chosen because of their good compatibility with titanium.

The structure and properties of surface layers of Ti-6Al-4V and Ti-4,5Al-2Mo-4,5V-0,5Fe after alloying using CO_2 -laser are investigated. It is shown that the structure of alloyed zone is defined by the amount of predeposited B or TiB_2 powder and laser beam power density. In the case of lower boron amount cellular, cellular-dendritic and dendritic structures are observed. The reason of these changes is discussed. When increasing the amount of boron TiB_2 -particles form in alloyed zone. Laser alloying with TiB_2 powder revealed less vaporization of powder than in the case of boron powder. Fully or partially soluted TiB_2 -particles are observed in alloyed zone, the degree of solution being connected with the initial size of TiB_2 -particles and laser power density.

After laser alloying with B and TiB_2 wear resistance of titanium alloys under sliding and erosion conditions is increased by a factor of 50-100 and 2-3 correspondingly.