

SUMMARY

The cold gas spraying process is a very competitive technology enabling the application of coatings, repair of machine parts and the production of new components. For specific applications, the surface of cold gas sprayed materials may require further processing. The dynamic development of the process is related to its high efficiency in the case of spraying Ti and Ti-6Al-4V coatings. These coatings are widely used for the production of structural elements in the aviation, automotive and marine industries.

In the presented doctoral thesis, the influence of laser processing parameters on the properties of cold gas sprayed Ti and Ti-6Al-4V coatings was assessed.

The scope of work includes:

- research of cold gas sprayed coatings,
- simulation studies of the laser modification process of cold gas sprayed coatings,
- research of coatings after laser processing.

The work was divided into two parts: literature analysis and experimental part. The literature part describes the warm spraying process, and in particular the cold gas spraying process. The focus was on its characteristics and discussion of the most important mechanisms associated with it. The literature part also contains information on the possibility of modifying cold gas sprayed coatings using a laser beam, which improves their properties. Basic information on the numerical modeling of these coatings is also presented. The literature part ended with a summary of the process of cold gas spraying of coatings and their laser processing. The experimental part defined the purpose and scope of the work. The research methodology and laboratory equipment used are described. The materials used for spraying coatings were characterized by examining their granulometric composition, grain morphology, phase composition and hardness. The results of testing the morphology, chemical and phase composition and the geometric structure of the surface of the tested Ti and Ti-6Al-4V coatings sprayed with cold gas and after laser modification are presented. Their tribological properties were determined: friction coefficient, wear intensity, weight wear and erosive wear. And also mechanical properties: surface roughness and microhardness. The experimental part contains the results of numerical simulation of the laser remelting process of cold gas sprayed coatings. The last chapter contains a summary and final conclusions from the conducted research. Further research directions were also identified. Based on the conducted research, it was found that laser modification of Ti coatings and Ti-6Al-4V contributed to the improvement of their microstructure and mechanical parameters. An improvement in tribological characteristics was also observed in the form of a decrease in the coefficient of friction and wear intensity. The research conducted in this work made it possible to achieve the assumed goal of the work.