

## CONCLUSIONS

The technology and equipment for cumulative-detonation spraying were developed. One of the most perspective way of application this method is spraying of protective coatings. However, now there is not enough true and unambiguous information about the effect of different on structural and phase state of the coatings sprayed by such a way. In this work structure of the composite coatings based on  $\text{Al}_2\text{O}_3$  were studied and their operational properties were analytically evaluated. Based on this data the following conclusions were made:

1) All coatings were produced with the thickness of up to 250  $\mu\text{m}$ ; the porosity at the level of 1...2.5 %; characterized by thin lamellar structure with volume fraction of lamellas of up to 5%;

2)  $\text{Al}_2\text{O}_3$  +5 % Ti (Ti substrate) coatings are characterized by: increased microhardness (9660...13770 MPa) due to formation of intermetallic phase of  $\text{AlTi}_3$ ; grain size 1,0...4,5  $\mu\text{m}$ ; subgrain size 0,1...0,6  $\mu\text{m}$ ; dispersed particles size 0,01...0,12  $\mu\text{m}$ ; dislocation density in coating  $2...3 \times 10^9$ , in substrate  $2...3 \times 10^{10}$ , in the contact zone  $5...6 \times 10^9$  (coating) та  $5...7 \times 10^{10}$  (substrate);

3)  $\text{Al}_2\text{O}_3$  +5 % Al coatings (Al substrate) are characterized by: decreased (7900...10250 MPa) due to formation of the plastic phase of Al, however it leads to increased cohesion and possibility of stress relaxation; grain size 1,0...4,5  $\mu\text{m}$ ; subgrain size 0,1...0,6  $\mu\text{m}$ ; dispersed particles size 0,01...0,12  $\mu\text{m}$ ; dislocation density in coating  $2...3 \times 10^9$ , in substrate  $2...3 \times 10^{10}$ , in the contact zone  $5...6 \times 10^9$  (coating) та  $5...7 \times 10^{10}$  (substrate);

4) Analytical evaluation of the operational properties has shown: in both cases, the largest contribution to strengthening the coatings (56%) made strengthening the matrix by dispersed particles of  $\text{AlTi}_3$  and Al, respectively; coating  $\text{Al}_2\text{O}_3$  +5% Ti (Ti substrate) characterized by quasibrittle intergrain fracture and coating  $\text{Al}_2\text{O}_3$  +5% Al (base Al) - by ductile fracture; in all cases there is a low local inner stress level, while maximum local inner stresses were found in the area of contact of the substrate, and coating, which do not exceed 14% of the theoretical shear strength

Dangerous and harmful factors that have negative effect on the health the operator of optical and electron microscopy laboratory and the influence of production factors on the formation conditions were analyzed. It is established that all factors considered are responsible to government safety standards.