THE INFLUENCE OF PRECIPITATION PARAMETERS OF VACUUM-ARC NANOCRYSTALLINE COATING TI-MO-N ON NANOHARDNESS AND WEAR RESISTANCE OF PISTON RINGS

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Purpose. It has been investigated the influence of multi-layered vacuum-arc nanostructure coating Ti - Mo - N on wear resistance of piston rings. The influence of vacuum-arc coating parameters on nanohardness has been set.

Metodology. The material on the multi-layered coating was applied by means of vacuum-arc method was the grey cast-iron widely used in different branches of engineering. Multi-layered two-phase nanostructural coatings TiN - MoN were precipitated in the vacuum-arc plant "Булат-6". Nanoindentation was conducted by means of a pyramid of Berkovich at loading 0,5 H with loading and unloading executed automatically. The tests for wear resistance were performed on the plant СМЦ-2.

Findings. Received dependences testify that nanohardness and given Young's modulus are of maximal in surface layers. The analysis of deflected mode has demonstrated that the highest value of compression (2,2 %) corresponds to the depth ~ 10nm. And maximal value of nanohardness takes place on the depth ~10 nm. The reason of residual stresses is an impact of ionic bombardment.

In case of studying the layers of thickness ~ 10 nm it is observed the forming of two-phase structural state. The interfaces occupy a large specific volume, that is accompanied by the increasing of compressive stresses. It must result in hardening, The research of layers of thickness ~ 20 nm showed more washed out interface border that leads to the reduction of specific deposit of borders.

Summary. Linear wear of cast-iron sprayed with coating Ti–Mo–N decreases in 8 times. Nanohardness increases on proximately 40 % in the same conditions of spraying at continuous rotation with the increasing of amount of layers from 1800 to 2700. Nanohardness increases on proximately on 25% at increasing of vacuum for all identical parameters of spraying the coating. The vacuum-arc precipitation performed at impulse voltage on a base , equal to 2000 provides the increasing of nanohardness on 30 % as compare to without impulse one at all other equal conditions for conducting the experiment.

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