C4-O-048102

INVESTIGATION OF A CERAMIC COATING OF ALUMINUM OXIDE OBTAINED BY VACUUM-ARC DEPOSITION[1]

A.YU. NAZAROV, E.L. VARDANYAN, A.A. TULINA, E.A. KORZNIKOVA

Ufa state aviation technical university, Ufa, Russia

Surface wear of cutting tools is determined by the predominant influence of adhesive and diffusion processes. Operating the cutting edge at a small constant cutting cross section does not destroy the substrate. In this case, tool resistance is determined by the characteristics of the tool surface, namely the protective coating. The dominant factor that leads to dullness of the cutting edge in this case is the thermal impact, the value of which is determined by the cutting speed.

Achieving new physico-mechanical properties is possible due to chemical and physical effects. It is known that oxide coatings (Al_2O_3, SiO_2, TiO_2, ZrO_2, B_2O_3, HfO_2, SeO_2, etc.) have a number of properties not inherent in metal and other types of coatings - low thermal conductivity, chemical inertness, wear resistance. The majority of oxides have high melting point, hardness and wear resistance. They are the most universal under operating conditions and can be used as corrosion-resistant, heat-resistant, heat-proof, electrical insulating and wear-resistant. The most effective is the coating, which includes aluminum oxide. To obtain coatings from aluminum oxide, the method of CVD is used more often, but this method is not widespread due to the fact that the temperature of deposition on these units is 1050 °C, the CVD method is used to obtain metastable modifications of Al_2O_3 because the transition temperature of θ-Al_2O_3 to less porous and harder α-Al_2O_3 is 1200 °C [3].

The purpose of this work is to study the physical and mechanical properties and structural-phase coating of caps based on aluminum oxide. An alumina ceramic coating is applied to study the wear of the carbide. Microhardness, adhesion strength, coating thickness, coating phase composition were investigated on the obtained samples. Results of researches expand knowledge about physical and mechanical properties of ceramic coverings of aluminum oxide deposited their plasma of vacuum arc discharge.

REFERENCES

[1] D. Loktev, and E. Yamashkin. "Main types of wear-resistant coatings" Nanoindustry vol. 5, pp. 24-31, 2007.

[2] M. Maximov. "Wear-resistant coatings as the driving force behind innovative processes in tool material technology and modern metalworking." NanoWeek, № 106, 13 – 19 April 2010.

[3] Chaly V.P. "Metal hydroxides." Naukova dumka, p.160, 1972.

[4] Zaycev A.N.., Yagopolski A.G., Alexandrova Yu.P. " Evaluation of the influence of structure and chemical composition of plasma-sprayed coatings on their adhesion and tribotechnical properties", vol.12, p.657, 2014

[5] Pogrebnyak A.D., Ilyashenko M.V., Bratushka S.N., Ponaryadov V.V., Erdybaeva N.K. "Physico-mechanical properties of ceramic and metal-ceramic coatings applied by plasma detonation method." FIP, vol. 4, № 1-2, pp. 48-72, 2006.

[1] The study was carried out with the financial support of the Ministry of Science and Higher Education of the Russian Federation within the framework of the state task of the Federal State Budgetary Educational Institution of Higher Education "UGATU" (agreement No. 075-03-2022-318 / 1) youth research laboratory of the REC "Metals and Alloys under Extreme Impacts"