THERMOMECHANICAL DIAGNOSTICS OF WEAR RESISTANT AlCrN COATING - HS6-5-2 STEEL SUBSTRATE SYSTEMS FOR THE OPTIMIZATION OF THEIR PVD TECHNOLOGY

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There is a significant temperature rise in contact between the machine tool for woodworking and the workpiece. This activates and strengthens, often synergistic, most mechanisms leading to changes in the operational properties of coatings. Currently, the most commonly used method to determine the effects of modification of cutting tool working surfaces by deposition wear resistant PVD coatings is the test operation of these tools. The results of tests on the thermal stability of coatings at the stage of developing new technologies or their optimization are not widely used. The research concerned the identification of thermomechanical sensitivity of PVD coating systems - HS6-5-2 steel substrate to heat induced stresses in them. The tests were carried out with the use of samples constituting physical models of PVD coating - substrate systems. It was assumed that in the tested samples there is a variable thermomechanical load of the surface by the deposited adhesive coating. Therefore, in metrological terms, they can be objects with variable rheological properties as a function of coating deposition technology, including temperature and time. The conditions for testing such systems are provided by Temperature Modulated Thermomechanical Analysis MT TMA. AlCrN coatings were deposited using cathodic arc evaporation with various technological parameters. Variable parameters of the technology were: composition of cathode material (AlCr, AlCrSi and AlCrB), the substrate bias voltage during coating deposition (-100 or -150 V) and the arc current (50, 60, 80 or 100 A). The substrates of the systems are cylinders with a diameter of 3 mm and a length of 30 mm. They were subjected to heating twice at 450°C for 4 hours. in an argon atmosphere. The thermal stability of the conditions of thermomechanical interactions between the coating and the substrate in the sample was identified on the basis of relative changes in the effective thermal expansion coefficient αAC of the substrate at 200°C and 450°C determined under temperature modulation conditions and absolute increases in the linear deformations of the substrate $\Delta(\Delta Ls)$ recorded at 20°C after another diagnostic heating of the coating - substrate system at 450°C. The analysis of the above results makes it possible to indicate the coating technology whose application promises the greatest service life of these wear resistant coatings.

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