

Magnetron sputtering of superhard nanocomposite nc-TiC/a-C coatings with carbide bond coating

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One of the current trends in surface engineering is development of compositions and technologies for deposition of superhard nanocomposite coatings.

The system of two magnetron sputters with titanium and graphite targets was used for deposition of the TiC/C system coatings. Conditions for production of the TiC/C coatings with an adjustable composition were investigated at the carbon content of a coating varied from 42 to 70 at. %. It was shown that at a C content of 42-54 at. % the coating consisted of nanosized TiC inclusions located in the amorphous C matrix. Sizes of the TiC inclusions decreased from 5.3-10.2 to 2.9-4.3 nm with increase in the C content of a coating from 42 to 54 at. %.

Investigations were carried out to study the effect of the WC-6Co bond coating 40-50 μm thick, deposited on the steel 40X substrate by detonation spraying, on properties of the TiC/C coating. It was found that the highest hardness values (up to 38 GPa) and elasticity modulus (up to 457 GPa) can be achieved in this case at a 2.8-3.1 μm thickness of the nc-TiC/a-C coating.