- **Nanocomposites and nanomaterials**

Structural engineering of vacuum-arc nanocrystalline multiperiod coatings

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Structural engineering is based on establishing the link between the structural state of physical and technological parameters of the formation of coatings. According to this, the aim of this work was to establish laws for different systems multiperiod vacuum-arc coating.

To study used a system of 2 types: Me-MeN, Me_1N-Me_2N (with titanium as base metal), obtained at the modernized "Bulat-6".

The possibilities of structural engineering at the multiperiod systems TiN/Ti, TiN/CrN, TiN/MoN, TiN/ZrN and ZrN/CrN. Highlighted the 3 most important parameters that determine the structural state and properties of coatings: the substrate potential during the deposition, thickness of the layers in the period and the pressure of the working atmosphere. The biggest impact substrate potential has on the mixing layers and texture, and therefore the most important for systems TiN/Ti and TiN/MoN. The thickness of the layers in the period largely determines the size of the crystallites, which is most important for the nitride systems with strong bond - TiN /ZrN. Thus in the case of a low heat of formation components such as CrN (systems ZrN / CrN and TiN / CrN) reduction in layer thickness to 30 nm leads to a reduction of the content of nitrogen atoms and the formation of a lower phase β-Cr_2N.

Influence of pressure greatest impact on the structure and properties of the nitrides of transition metals with relatively low heat of formation - CrN and MoN. Based on the results of structural engineering proposed precipitation regimes that provide high mechanical properties of the coatings.