

# **Formation of advanced nanostructured coatings by hybrid electron beam process**

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The paper deals with variants of electron beam processes of evaporation and subsequent condensation of inorganic substances at the rates of 1 - 50  $\mu\text{m}/\text{min}$ , combining the traditional processes of physical and chemical deposition (PVD and CVD).

The paper presents the developed functional and structural metal, ceramic and metal-ceramic coatings (thick films) of 5–10  $\mu\text{m}$  up to 1-2 mm thickness with specified nano- and micro-sized structural elements (grains, phase particles, pores and layers).

Composition and quantity of the initial evaporated substances, temperature of the condensation substrate, active gases ( $\text{N}_2$ ,  $\text{O}_2$ , etc.) bled into the working chamber and vapours of reactive substances, additionally evaporated in the working chamber, are the main process parameters, allowing adjustment of the coating structure and properties in a broad range.

The paper gives examples of “structure-property” dependencies, in particular, dimensional-structural effects of hardness of two-phase coatings with a dispersed and laminated structure.

Areas of practical application of thick films and directions of further investigations and developments are noted.