



POWDER MATERIALS WITH NANO-LAYER COATINGS

Developer – Welding Faculty of National Technical University of Ukraine
"Kyiv Polytechnic Institute"

Project supervisor: V. Kopylov, DSc, professor

Contact information: tel.: +380 44 406-8242

Email: zf@ntu-kpi.kiev.ua

Project objectives: production of nano-layer coatings by means of plating

Background and brief project specification

In materials technology there is a combination of different methods of composite coating production with metals, ceramics and nano-structured alloys as the coating basis. Multi-functional protective coatings with new and improved characteristics can be obtained by varying the nano-particles type, shape, dimensions and methods of their insertion.

New multi-component coatings have different powder combinations.

The process of powder blends production and formation of complex joints with pre-defined stoichiometry including nano-particles consists of several stages. It starts with production of the powder blend consisting of macro-particles 20...60 μm dia and of superdispersed particles 10...40 nm. Production process is performed by means of mixing and thermo-deformative ion treatment in vacuum. Next stage is powder plating.

In parallel with plating of multi-component blend and formation of nano-structures as layers or separate dispersed phases consolidation of macro- and micro-particles is observed resulting in formation of granules and synthesis of new phases with different types of nano-components.

As a result, thermo-deformative treatment and modification of surface of blend components allow to produce micro-granules in a disperse-hardened composite form. Its structure is characterized by extended surface of grain and sub-grain boundaries stabilized with nano-dimensional compounds of different types.

Practical application

Plated powders are used to produce by plasma-thermal technology protective layers (heat-resistant, corrosion-resistant, wear-resistant) containing nano-particles. In powder metallurgy they are used to produce composite materials. They are also used as components of new catalysts.