

WEAR RESISTANT DETONATION SPRAYED COATINGS

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Detonation spraying (DS) is one of the thermal spraying technologies which are widely used for the deposition of wear resistant, electro-insulating, surface protecting, and other functional coatings on surfaces and mechanical parts from different materials.

The fully computer controlled detonation spraying (CCDS), developed in Lavrentyev Institute of Hydrodynamics, was successfully applied for different powders: metals (aluminum, copper, iron, nickel, cobalt, molybdenum, etc.), alloys (steel, cast iron, nickel-chrome, brass, duralumin, self-fluxing alloys, etc.), ceramics (alumina, zirconium dioxide, chrome and titanium oxides, etc.), cermets (carbides of tungsten, chromium, titanium with a binder). Nanostructured and nanocomposite powder can be sprayed preserving their initial nanostructure.

Detonation coatings can be deposited on substrates made from metals, ceramics, plastics, even wood and can coat surfaces of arbitrary shapes with an incidence angle up to 60 degrees. For the majority of materials the coating thickness can exceed several millimeters.

Optimisation of spraying parameters is supported by numerical simulation and optical diagnostics.

A CCDS installation equipped by a precise-dosage twin powder feeding system was used for the deposition of multimaterial coatings. Computer control provides a flexible programmed readjustment of the detonation gases energy impact on powder thus allowing selecting the optimal for each material spraying parameters to form high-quality composite coatings.

Microstructure, porosity, microhardness, bond strength and wear resistance measurements were measured for a number of powders. For example, for WC/Co (88/12 wt.%) coatings, the following properties have been achieved: porosity less than 0.5%; microhardness 1400 HV₃₀₀, ASTM G65 abrasion wear less than 1 mm³/1000 rev.

Wide range of applications for different industries are justified: hardening of aero-engine parts, increase of the services life-time of oil drilling equipment, enhancing of performance of oil- gas transportation systems, and restoration of different wear joints as well.