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THE STUDY OF THE INFLUENCE OF SURFACE PRETREATMENT ON THE PROPERTIES OF PLASMA COATINGS

Plasma-sprayed coatings are used in a wide range of industrial applications, primarily for wear resistance, thermal barrier and corrosive environment [1,2]. A thermal spray coating is built up and the microstructure is formed, when individual, fully or partially molten particles, traveling at a particular velocity, flatten, adhere and solidify on impact with the substrate [3-7].

Experimental works were aimed on the material bola Non-alloy quality structural steel S 235J2+N EN 10250-2-2000. The test plates were 200 mm wide, 250 mm long and 8 mm thick. In the experiment were made the following types of coatings:
- coating Al_2O_3 granularity of 40-90 μm,
- coating Al_2O_3 with interlayer NiCr
- coating Al_2O_3 + 5% Ni /Ni granularity 50-90 μm/
- coating Al_2O_3 + 12% Ni /Ni granularity 50-90 μm/
- coating Al_2O_3 + 20% Ni /Ni granularity 50-90 μm/.

Surface pre-treatment of test samples was realized by abrasive blasting using used steel granulate dG = 0.6 mm of an auteutectoid heat treated steel. Blasting medium has homogeneous structure of martensite and bainite (hardness 460 - 600 HV 30), which fulfills the condition of optimum reflective elasticity and resistance to material fatigue. Blasting medium was accelerated by compressed air and the air pressure was 0.4 MPa.

Plasma spraying of the coatings was realised using a water-stabilized Pal-160 plasma torch. The spacing of the samples from the mouth of the plasma torch was 350 mm. Plasma gas composed of dissociated molecules and ionized hydrogen and oxygen atoms was used in a 2: 1 ratio.

The microgeometry of the coatings was evaluated using stylus profilometer Surftest SJ-301, Mitutoyo, Japan. Structure analysis of the coating structure was observed using REM JEOL JSM-7000 F with a micro analyser.

The evaluation of the coatings Al_2O_3, Al_2O_3 + 5% Ni, Al_2O_3 + 12% Ni, Al_2O_3 + 20% Ni are found only minor differences. The highest coating thickness was coated with Al_2O_3 + interlayer NiCr. It is a bilayer coating of 387 μm.

The average roughness values of Ra, Rz did not show large differences (Fig. 1). . The results of surface evaluation of the blasted base material confirmed the correct use of the blasting materials in terms of proper roughening of the surface before subsequent application of the coating and the blasted surface in terms of recommended roughness values (Ra = 8-12μm) matched the required interval. The surface at the end of the blasting was markedly segmentated. The segmentation allows for a good mechanical anchoring of the coating to the surface of the base material.

The metallographic analysis results are documented in Fig. 2 to 4. Since all coatings were classified as satisfactory according to the metallographic evaluation, only some surfaces have been documented. The average thickness of the interlayer NiCr is 103 μm. The applied interlayer was compact without interruption between the substrate and the Al_2O_3 coating. All tested coatings have a clear interface between the base material and the layer. This fact is a sign of the good adhesion of the particles of the sprayed material to the unevenness of the pad.

The investigated coatings were classified as satisfactory in terms of the compactness of surface coverage of the samples examined, the morphology of surfaces, the low level of defects on the surface or in the individual layers. Among occurring defects can include pores or inadequately remelted particles. Their share in the samples examined was minimal.

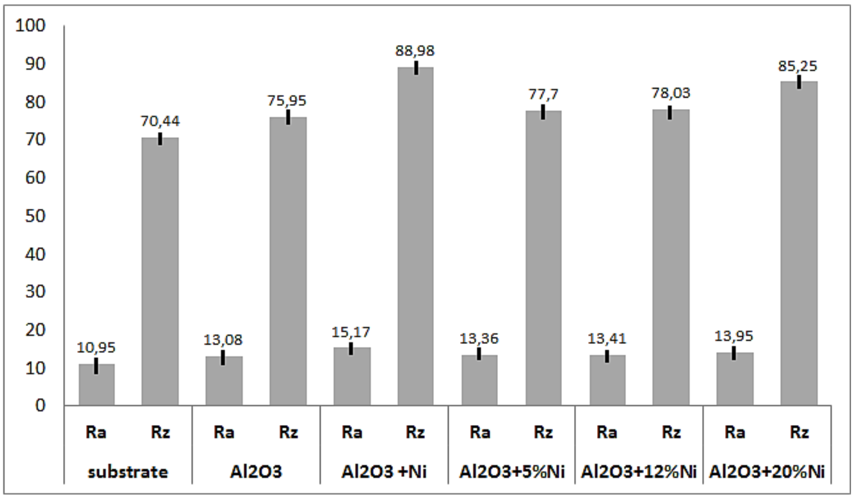

Fig.1 Average values of Ra a Rz in [µm] for rated surfaces

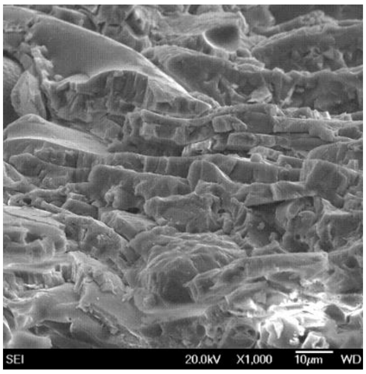

Fig.2 Lamellar structure of Al_2O_3 coating

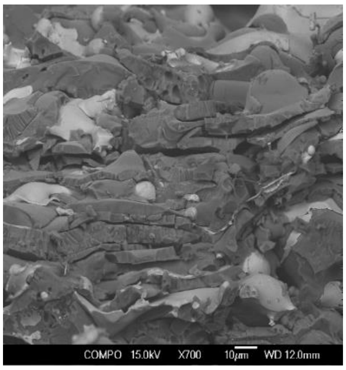

Fig. 3 Structure of Al_2O_3 + 12% Ni coating

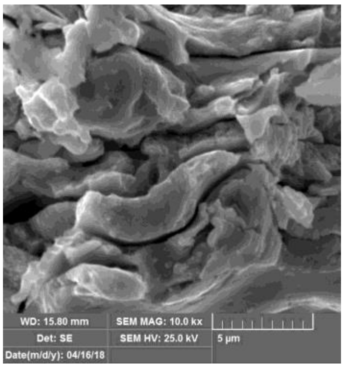

Fig. 4 Structure of Al_2O_3 + 20 % Ni coating

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