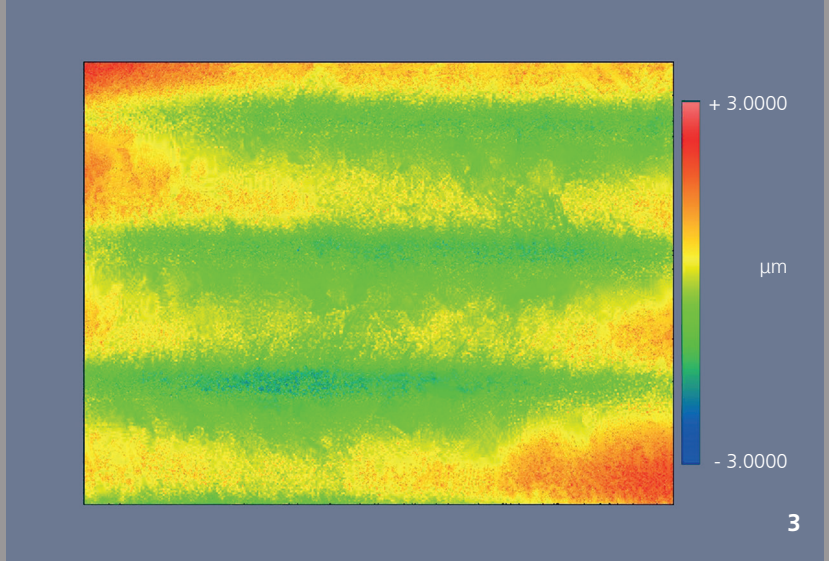

GENERATING THIN LAYERS WITH GOOD SURFACE QUALITY BY TWO-STAGE LASER COATING

Task

The project shall develop a two-stage coating process that makes it possible to select a high surface quality in a melt-metallurgical connection to the substrate in the layer thickness range of 20 to 300 µm. In addition, large area rates (A ≥ 0.5 cm^2/s) are to be achieved with regard to industrial conversion.

Method

In the first stage, the coating is applied by means of an »air spraying process«. The powdery coating material (content about 70 percent) is, in this case, in an aqueous solution with proportions (< 3 percent) of chemical additives, including binders and antioxidants. Subsequently, the coating is dried at about 80 °C and melted by means of laser radiation.

Results

So far, a stainless steel (1.4404) and a Ni-based alloy (Deloro 22) have been tested. Crack-free and low-pore layers with thicknesses of 80 to 100 µm were produced and bonded to the base material metallurgically. The parameter studies show that surface area and surface quality cannot be improved in the same direction. The roughness value currently obtained for a surface rate of A = 0.5 cm^2/s is limited to Ra ≈ 3 µm. For smaller surface rates, however, a roughness of Ra ≈ 0.5 µm can be achieved. The focus of further research will be the application of the layers to components.

Applications

Fields of application are, for example, the wear protection in tool and mold making and the production of functional layers in the electronics industry.

The work has been carried out in the context of a CORNET project (German project partner AiF) together with the Belgian institute CRIBC in Mons.

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3 Image of the surface of a layer out of Deloro 22 (Ra = 0.43 µm +/- 0.02 µm) with a white light interferometer for a measuring field size of 0.35 mm x 0.26 mm.