

Precise formation the phase composition and the thickness of nitrided layers

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ABSTRACT

Purpose: The article presents the application of the duplex technology (nitriding plus PVD) to modification of the surface of pressure casting dies made of steel WCL (EN: X37CrMoV51). In this technology, there are clearly defined expectations regarding the properties of the surface layer of the dies obtained in the nitriding process. The main part of the article is presentation a complex system of designing, in-situ visualization and control of the gas nitriding process.

Design/methodology/approach: In the conception of computer designing, analytical mathematical models and artificial intelligence methods were used.

Findings: As a result, possibilities were obtained of the poly-optimization and poly-parametric simulations of the course of the process combined with a visualization of the value changes of the process parameters in the function of time, as well as possibilities to predict the properties of nitrided layers.

Practical implications: Computer procedures make it possible to combine, in the duration of the process, the registered voltage and time runs with the models of the process.

Originality/value: For in-situ visualization of the growth of the nitrided layer, computer procedures were developed which make use of the results of the correlations of direct and differential voltage and time runs of the process result sensor (magnetic sensor), with the proper layer growth stage.

Keywords: Process systems design; Thermo-chemical treatment; Nitriding process; Nitrided layer design; Magnetic sensor; Artificial intelligence

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