metal in the condition of self-propagation high-temperature synthesis (SHS). The alloys based on copper: C95510, C62300, C95200, C85800 served the source data for study. As saturating ambiences are used the mixture powders following material: oxides of chromium (Cr_2O_3), alumina (Al_2O_3), metallic molybdenum and aluminum, chloride ammonium (NH_4Cl) and iodine (I_2). Processing conducted at the temperature 800…1000 ºC during 0,5…1,5 hour.

The diffusion method of the surface saturation from hard phase in active gas ambience on the basis of analysis of the requirements, presented to copper covering and the way of the metal saturation for defensive covering obtaining has been chosen. This method provides for high surface quality and it is the simplest and most suitable one in laboratory practice being well reproduced in production condition and it does not demand for special complex equipment while it's realizing.

Research of reliability of mechanisms is proved in most cases quick wear-out of the details, made from bronze C62300 (the bushings, anything numbered six), occurs because of roughness of the associate detail. Most wear-out of the bronze details occurs at period of the wear-in, during which value break-in wear-out can form 60-70 % general tolerance for wear-out. Research of the influence of the nickel covering on a wear-out sample (V = 2,5 m/s, P = 1,0 MPa) were made on installation for test material on detritions. As rear body was used the bar from fast-cut steel R6M5, hardened to hardness HRC 62 - 65. To two parties samples of 10 pieces each were subsected to the test: the first party was without covering, the second was with nickel and silicon covering by thickness 10 - 65 μm.

Using nickel saturation of allows in 1,5 - 2 times raises wear capability a sample in consequence of reduction of the factor of friction. Herewith improve the steady-state factors to resistivity of the surfaces sample to detritions. The Analysis shows that using on sample of the nickel covering promotes increasing to reliability of the product as a whole. Thereby, executed studies point to perspective using silicon saturation and nickel saturation as a efficient tribotechnical covering.

STUDY OF THE FORMATION OF MULTICOMPONENT TITANIUM COATINGS ON STEELS UNDER NON-STATIONARY TEMPERATURE CONDITIOS

SEREDA B. & PALEHOVA I.
Dniprovsk State Technical University, Ukraine

Purpose. Study of the formation of multicomponent titanium coatings on steels under non-stationary temperature conditios.

Methodology. The studies were carried out under the conditions of chemical-thermal surface treatment method.

Findings. In order to improve the reliability of equipment, reduce the cost of its maintenance, increase the service life, titanium-based coatings are widely used. Since in difficult operating conditions one-component titanium coatings are not able to provide the necessary working properties of products, it is advisable to saturate the metal surface with several elements. Joint saturation of Ti, Al and Si steels allows not only to increase the hardness of the surface layer, heat resistance and corrosion resistance of products, but also to increase the thickness of applied coatings and accelerate the process of their formation.

Surface hardening of products from structural and alloyed steels is widely used methods of chemical-thermal surface treatment (HTO). HTO technology is a fairly effective method of surface hardening aimed at obtaining continuous, non-porous and resistant protective layers in aggressive media, which have good adhesion to the substrate. However, this method of processing is characterized by a considerable duration of technological processes (10-15 hours), resource and energy consumption. The aim of the work was the development of powdered SHS-mixtures for the deposition of multicomponent coatings on the basis of titanium in the regime of thermal autoignition, the study of the physicochemical processes of coating formation, the determination of the optimum technological parameters of the SHS process in complex saturation, the study of their influence on the kinetics of layer growth and their evaluation quality.

The choice of the optimum mixture composition for conducting SHS- processes in the conditions of thermal autoignition was carried out based on the results of studies of the thermal picture of the SHS- process and the physical and mechanical properties of the protective coatings.The efficiency of processing is determined by the time parameters of the processing process and the thermophysical characteristics of the charge.It has been experimentally established that with an increase in the processing temperature and an increase in the duration of isothermal aging, the thickness of the diffusion layer increases.Coatings obtained in SHS processes consist of the film of the deposited product and a wide gradient diffusion zone, which is why they have improved characteristics in comparison with diffusion analogs, and are also characterized by high adhesive strength.

When diffusion of noncarbide-forming elements in γ-iron after reaching the solubility limit, γ → α-transformation occurs. In α-iron, the solubility of carbon is negligible, so it is pushed back into the substrate with the formation of a zone with a high content of carbon under the coating. With increasing content of aluminum and silicon in the charge, the thickness of the coating increases, however, to achieve high concentrations of all saturating elements in the coating, the content of Si and Al in the charge is recommended to be limited to 10% by weight. The density, porosity and roughness of the coatings depend on the Si content of the mixture, with an Si content of ~ 10% by weight. pores have a predominantly rounded closed form. With an increase in the concentration of silicon in the charge, the roughness of the coatings increases, the height of microroughness reaches 15-

20 micronsWhen studying the protective layers on the PMT-3 device it was established that the microhardness of the α-solid solution is 350-200 HV, the microhardness of the complex silicide on the surface of the steels is 1100-1000 HV. Conducted tests of SHS coatings for corrosion resistance showed an increase in this index by 1.5-1.8 times compared with the diffusion analogue.

INCREASING THE LEVEL OF PHYSICAL AND MECHANICAL PROPERTIES OF COLD-ROLLED STEEL OF THE BRAND DC01 IN ORDER TO ENSURE ITS REQUIREMENTS EN 10130 IN THE CONDITIONS OF PJSC "ZAPORIZHSTAL"

TISHCHENKO A., PANCHENKO G.,
SPICHAK A. & SEREDA B.
Dniprovsk State Technical University, Ukraine

Purpose. Increasing the level of physical and mechanical properties of cold-rolled steel.

Methodology. To ensure the compliance of the mechanical properties of the rolling stock a production technology has been developed that includes the smelting of steel with a restriction on the content of reinforcing elements, hot-rolled strips for hot rolling without cooling by water, heat treatment of c / k rolls in gas hoods.

Findings. At present, the cold rolled steel of the brand DC01 manufactured in the ZHP-1 PJSC "Zaporizhstal" does not fully comply with the requirements of EN 10130: 2006. The main technical characteristics that are not met in the manufacture of rolled products are the mechanical properties of rolled products (higher values for the "yield point" parameter). The level of compliance of the mechanical properties of rolled stock with the requirements of EN 10130: 2006 was 63.5%. The average yield strength was 274 MPa at the maximum required 280 MPa.

In order to ensure the compliance of the mechanical properties of the rolling stock with the requirements of EN 10130: 2006 on PAO Zaporizhstal, a production technology has been developed that includes the smelting of steel grade DC01 with a restriction on the content of reinforcing elements (carbon max 0.10%, manganese 0.20-0.40 %), sulfur max.0.03% and phosphorus-max.0.025%), hot-rolled strips for hot rolling without cooling by water, heat treatment (annealing) of c / k rolls in gas hoods. "Ebner" or stoves with HN-x-shielding gas according to the regime of steel grade 08UY.