INVESTIGATION OF THE FEATURES OF THE FORMATION OF ALUMINIZED COATINGS UNDER THE CONDITIONS OF SHS

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Purpose. Investigation of the features of formation of aluminized coatings under the conditions of SHS.

Methodology. The influence of temperature and time of saturation on the aluminized layer thickness received on carbon and a doped steel is analyzed under the conditions of high-temperature synthesis method.

Findings. Self-propagating high-temperature synthesis (SHS) is a chemical process that occurs with heat release in autowave mode, a type of combustion leading to the formation of solid products. Thermal decomposition of complex reagents, oxidation-reduction reaction, synthesis of simple substances etc may take place as chemical stages SHS. Mixtures for SHS consist of fuel (often metals or volatile compounds), oxidizer, as well as fillers and functional additives; which are introduced to regulate the composition and structure of the base products. Typical reagents - refractory metals (Ti, Zr, Hf, V, Nb, Ta, etc.) and nonmetals (B, C, Si), gases (N_2, O_2, H_2), oxides, metal halides and metal-reducing agents (such as A1 and Mg), metal hydrides, organic and organometallic compounds, mineral raw materials and industrial solid waste. Oxygen-free refractory compounds (borides, carbides, nitrides, silicides), intermetallics (aluminides, etc.), chalcogenides, complex oxides (titanates, niobates, tantalates, ferrites, etc.), hydrides, phosphides, and various nonstoichiometric phases, single phase solid solutions of binary compounds (eg, carbonitrides), and others are obtained by SHS method. Organic compounds can be produced also in the SHS mode

In this paper we research the structure, phase composition of aluminized layer obtained in the mode of combustion and thermal self-ignition of SHS systems containing Cr_2O_3, Al_2O_3 activators of NH_4Cl, NaF. To determine the protective properties the samples were heated up to t ° 1000-1100 ° C and held for 15 to 60 minutes, as the substrate were used steels 45, U8A, ShKh15. Then thin sections were made on these samples, and general depth and thickness were determined. Coating structure was studied on materialographic microscope Neophot-2 and subjected to X-ray diffraction analysis. To determine the type of phases and their distribution over the depth of the diffusion layer, the depth profiling X-ray analysis was carried out after successive etching of layers of thin section thickness of 0.05 mm.

The thickness of the layer also increases with increasing exposure time. In this case, the interface between the outer and inner zones of the layer does not change. This indicates that the magnitude of increase in the sample is equal to the outer zone of the layer.

The mechanism of coverings formation received at non-stationary temperature conditions is also considered in this article. The system includes Cr_2O_3, Al_2O_3, Al, NH_4Cl, NaF. The duration of saturation process by aluminum and chrome changed from 15 till 60 minutes. The covering structure consist from intermetallide compounds FeAl, Fe_2Al_5, carbide Fe_3C_4 and α -solid solution of chrome and aluminum in α - Fe. The influence of temperature and time of saturation on the aluminized layer thickness received on carbon and a doped steel is analyzed. Therefore the investigated materials can find wide application in chemical mechanical engineering and automobile industry. This method provides high surface quality and it is the simplest and most suitable one in laboratory practice being well reproduced in production condition. The empirical results showed that increasing the saturation duration from 15 to 60 minutes causes the thickness increase of the layer at heating temperature of 1000 ° C on a sample of 45 steel from 35 to 85 microns, on a sample of U8A steel from 50 to 101 microns. We have thus shown that the outer zone in the aluminized layer is formed in the process of saturation by co-deposition of iron and aluminum from saturating medium. Phase composition of coatings is a serial arrangement of FeAl, Fe_2Al_5, Fe_3C. Microhardness of the aluminized layers is within the limits of 11000 - 12500 MPa.

OBTAINING WEAR-RESISTANT COATINGS ON COPPER ALLOYS UNDER SHS CONDITIONS

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Purpose. Obtaining wear-resistant coatings on copper alloys under shs conditions.

Methodology. The studies were carried out under the conditions of high-temperature synthesis method.

Findings. The choice of node construction material details development of friction while trying to get high performance characteristics is one of the base problems in machine building. The main aim is a selecting known and creating new materials, possessing optimum characteristics, providing necessary resources for a given node development of friction. In this connection it's important that for node material development of friction to be obtained from available undeficit components using technology, requiring standard equipment, high vacuum, cryogenic temperatures and expensive technologies. While selecting node material development of friction it must be taken account their compatibility, especially it's property of dripping and the following edge fin those are connected with chemical affinity, proximity to constitution and value of parameter of crystal lattices.

One of the most efficient methods of the creation covering, possessing high mechanical and physic-chemical characteristic, is diffusion surface saturation of a