

# Structure and properties diffusion coatings on the basis of silicium and chrome

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The deposited diffusive coatings on the basis of several components allow combining properties of separate elements with the special performances of their connections [1]. Simultaneous saturation became chrome and silicon results in formation of complex diffusive beds having higher corrosion and heat resistance than chromium-plated [2,3].

In National Technical University of Ukraine "KPI" the new ways and compositions of initial reagents for complex saturation of carbon steels by silicium and chrome are developed. In a given work, an effect of the complex saturation of the carbonaceous steel by silicon and chromium as well on its corrosive stability in the concentrated solutions of acids at a temperature of 20°C has been studied.

The applying process of the chomosilicide coatings onto the carbon steel\* (20, 45) surface has been performed at a temperature of 1050°C for 6 h. The compositions containing an expedient amount of the ferrosilicon powders and chromium have been used as the saturating steels, whereas ammonium fluoride has been used as an activating agent. The coatings got under the accepted conditions of diffusive saturation have been established to represent themselves a composition of the  $\alpha$ -solid silicon and chromium solution. The silicon concentration decreases sharply with penetrating into the diffusive layer. The phase  $\text{Cr}_{23}\text{C}_6$  and  $\text{Cr}_7\text{C}_3$  are formed on surface of protective chromosilicide diffusion coating with support silicon until 0,25% at. The reasonable thickness of coatings is of 80 to 120  $\mu\text{m}$ . The typical microstructure of steel 45 after complex saturation by silicium and chromium is presented in Figure 1.

The corrosive and electrochemical studies have been performed in the concentrated solutions of sulphuric and nitric acids, and the same solutions containing the corrosion inhibitors. The corrosion and electrochemical explorations realized with carbon steels and steels with diffusive coatings in concentrated solutes acids and also

Table. Combined protection from corrosion of steel 45 CrSi coatings and inhibitors

| Acid                         | Inhibitor, 3 g/l | $\gamma$ | Z, % |
|------------------------------|------------------|----------|------|
| 10% $\text{H}_2\text{SO}_4$  | ICS              | 10,0     | 90,1 |
|                              | OK               | 20,0     | 95,1 |
| 10% $\text{HCl}$             | ICS              | 198,0    | 99,4 |
| 10% $\text{CH}_3\text{COOH}$ | ICS              | 190,0    | 99,3 |
| 10% $\text{H}_3\text{PO}_4$  | ICS              | 20,0     | 95,2 |
| 10% $\text{HNO}_3$           | OK               | 340,0    | 99,9 |

Note: ICS - KPI-1+ $\text{NH}_4\text{CNS}$ , KPI-1 – heterocycle nitrogen containing substance, OK – oxidizer,

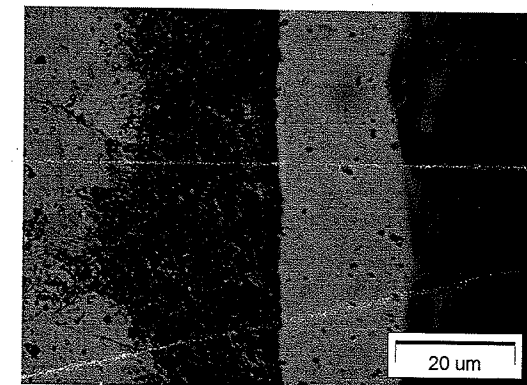


Figure 1. Microstructure of steel 45 after complex saturation by silicium and chromium

