

Properties of Colored Phosphate Coatings for Corrosion Protection of Steel

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Abstract: Phosphate coatings obtained from solutions based on the drug containing $\text{Mn}(\text{H}_2\text{PO}_4)_2 \cdot 2\text{H}_2\text{O}$ (proportion of phosphoric acid, in terms of P_2O_5 46–52 % ; mass fraction of manganese not less than 14 %). Phosphating solutions are widely used to produce protective films at low temperatures. To obtain colored coatings, it is proposed to introduce the dyes procyon olive green and methylene blue in the amount of 8 g/L into phosphating solutions. Colored phosphate films unevenly cover the surface of steel samples (Figure 1). The protective and physical and mechanical properties (thickness, heat resistance, wear resistance, breakdown voltage value) of colored phosphate coatings obtained on steel by the cold method are studied. The protective properties of phosphate coatings strongly depend on their thickness and the nature of the crystal structure, since the thickness and structure determine the porosity of the coatings, and, consequently, the freedom of access of the aggressive medium to the metal surface. It was found that phosphate coatings can withstand short-term heating up to 100 °C, after which their protective ability is greatly reduced (Table 1). Colored phosphate films produced on steel by the cold method have low values of the coefficient of friction (0.1–0.15), but this disadvantage can be eliminated by impregnation with lubricants. The breakdown voltage of colored phosphate coatings is about 200 V (Table 2). Its electrical insulation properties can be improved by impregnation with oil and bakelite lacquers.

Keywords: phosphate coatings; corrosion protection; steel corrosion; color phosphating; protective coatings; characteristics of coating; porosity of coating; wear resistance

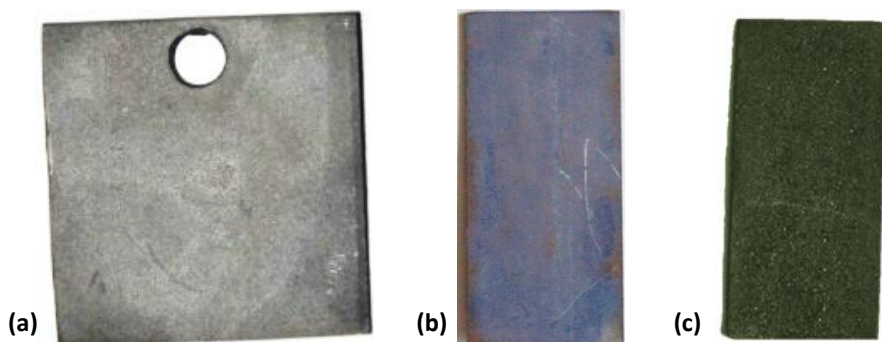


Figure 1. Images of phosphate coatings obtained at room temperature: (a) uncolored; (b) blue; (c) green.

Table 1. Results of tests of the protective properties of phosphate coatings by the drip method after heating.

Type of phosphate coating	Control time immediately after phosphating, sec	Control time after heating, sec		
		100 °C	200 °C	300 °C
Uncolored	460	135	75	3
Green	430	125	79	2
Blue	435	122	72	2

Table 2. Results of tests of the protective properties of phosphate coatings by the drip method after heating.

Type of phosphate coating	Breakdown voltage, V
Uncolored	200
Green	184
Blue	190