

## Comparative effectiveness of cation fluorine-containing surfactants in the process of manufacture of galvanic nickel coatings containing fluoropolymer particles.

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We have developed an electrochemical method to produce nickel coatings containing fluoropolymer particles. The indispensable condition of successful carrying out the process of electrodeposition is an addition in an electrochemical bath of surfactants which chemical nature considerably affects stability of fluoropolymer dispersions in the electrolyte and their electrophoretic mobility. The criterion of effectiveness of surfactant action may be electrokinetic potential of the dispersions and increase of the fluoropolymer content in the coating.

The following fluorine-containing surface-active materials of cation type were studied: Flactonits K-7, K-9 and K-76. They produce by Federal State Unitary Enterprise "Russian Scientific Center Applied Chemistry".

The study has shown that an addition of Flactonit K-76 to the electrolytic tank results in electrochemical potential of fluoropolymer particles equal to 32 mV, that three times higher than in case of addition of Flactonit K-7 and 1.5 times higher in comparison with addition of Flactonit K-9. The use of fluorine surfactants (3) for manufacturing coatings made possible to introduce for the first time 18.5 wt.% (50% by volume) of fluoropolymer into the nickel matrix. There were carried out comparative tests with addition of *ethonium* (diquaternary ammonium salt containing no fluorine) and with addition of a mixture of ionogenic (*ethonium*) and non-ionogenic surfactant (OP-10). The maximum content of fluoropolymer in the nickel matrix was 3wt.% (12% by volume) at addition of the surfactant mixture (5% of ethonium and 5% of OP-10).

Thus the given experimental data are evidence of perspective use of fluorine-containing Flactonit K-76 for manufacturing nickel-fluoropolymer coatings with an increased fluoropolymer content. The increase of fluoropolymer content in the coating promotes adhesion of the nickel-fluoropolymer layer with the upper layer of pure fluoropolymer that is of great importance in manufacturing two-layer coatings for protection metals against corrosion in aggressive media.

### Experimental.

The experiments were carried out in a special laboratory of technology of electrochemical production. The suspensions were prepared by dispersion of fluoropolymer powder F-40 in

surfactant aqueous solutions at mechanical mixing. Dependent on dispersivity of fluoropolymer powder and the surfactant nature there were obtained stable suspensions at the following ratios of the dry residue and surfactant in grams: 1:0.02....0.04

From the suspensions prepared by means of electroprecipitation at current density of 50...500A/m<sup>2</sup> and time of 5...60 sec there were produced fluoropolymer coatings of 5-100 micron thickness. After thermal trating at 300<sup>0</sup>C for 0.5 hour the appearance of the coatings is transparent, non-porous, glossy. Adhesion of the coatings to the metal base by bending test is satisfactory.