THE EFFECT OF AN ELECTRIC ARC ON THE MICROSTRUCTURE OF COMPOSITE Cu-Cr, Cu-W, Cu-Cr-W ALLOYS, OBTAINED AFTER VIBRATIONAL REACTIVE INFILTRATION OF POWDERS BY COPPER MELT

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Alloys Cu–Cr, Cu–W, Cu–Cr–W (≥ 50 wt.% Cu) were obtained by infiltration of Cr, W uncompacted powders or their mixtures by copper melt. After electric erosion tests of the obtained alloys, a comparative analysis of the changes in the microstructure was carried out. The expediency of completely or partially replacing of W with Cr for electric contact materials is shown.

Cu-W composite alloys are widely using as electric contact materials, but in many countries, there is a tendency to replace them with the Cu-Cr alloys [1,2]. Comparative arc tests of Cu-W (70%) and Cu-Cr (50%) composites show a higher electroerosion and arc welding resistance of the Cu-Cr contact pairs, as well as a lower and more stable transition resistance. The mechanisms of higher arc resistance of Cu-Cr alloys are still not completely clear. In the published studies, there is also no data on the joint influence of W + Cr additions on the functional properties of electrical contacts.

The aim of this work was to study the changes in the microstructure of the switching surfaces of different composite alloys after comparative tests under the action of an electric arc.

The alloys were obtained by the infiltration of uncompacted Cr and W powders or their mixtures with a copper melt at the laboratory device [3]. For arc resistance tests, we used a machine that simulates the operation of an AC contactor at a test current of 125 A, a voltage of 50 V, and a number of arc on/off cycles N = 5000.

The microstructure of the switching surfaces of contacts was studied (the sections of the contacts were made in a perpendicular direction to their working surface). In fig. 1 is shown the microstructure of the operating layers of the bottom electrodes for different compositions.

Based on the present research, conclusions were drawn about the effectiveness of the presence of chromium in the composition of electrical contacts. Chromium strengthens the copper matrix in the form of various structural generations. In addition to the presence of primary and secondary chromium, alloys contain intermediate metastable structural complexes of ultra-fine mixtures [Cu_{liq}+Cr_{sol}], the structure of which was described in [4]. Thus, when the electrical contacts operate, the Cu matrix strengthened with chromium inclusions suffers under an electric arc to a lesser degree than the W-Cu alloy with a matrix of pure copper.

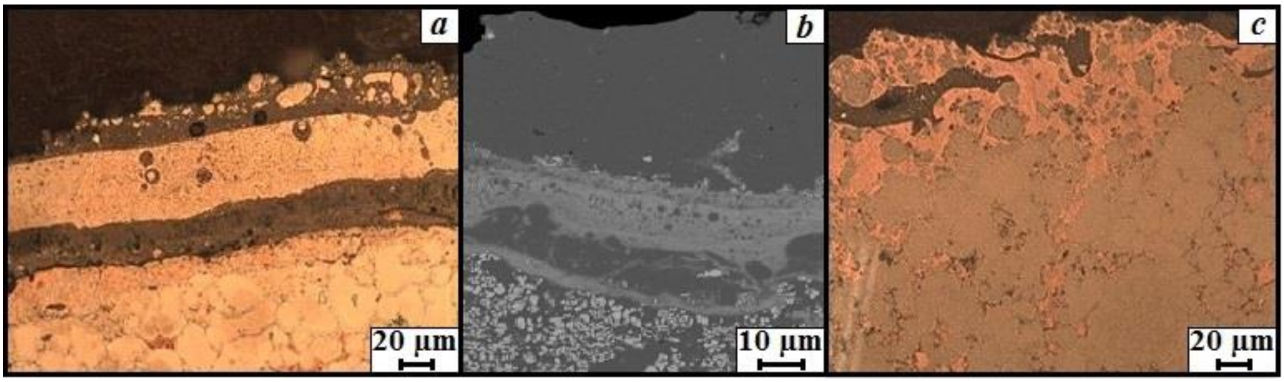

Fig. 1. Microstructure of the upper layers of Cu-Cr (a), Cu-W (b), Cu-Cr-W (c) alloys after arc resistance test

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THE CORRECTION OF GROSS BETA MEASUREMENTS OF THE SURFACE SEDIMENT IN THE DIFFERENT URBAN ZONES.

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The contemporary sediment in the surface urban zone derived from the natural and artificial processes. The measurement gross beta in the urban sediment it is indicator for the radioactive content and transport. The bulk urban samples are fractionated with three fraction size. The count rate for different masses of the same samples were measured and the relative count rate was estimated. The dependence on sensitivity on the size fraction may be caused by different relative projective area of large and small size grains when small amount of the material is available for the analysis. It is concluded the efficiency of the detection system depends on the size fraction of the sediment sample.