STUDY THE ELECTRIC CONDUCTIVITY OF COPPER-BASED POWDER COMPOSITION ALLOYS

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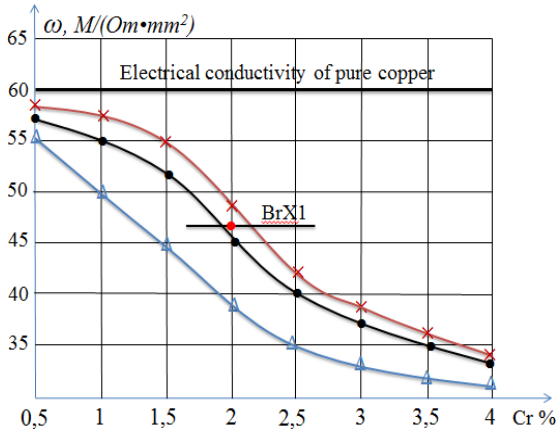
Globally, the demand for efficient powder composite materials for electrodes is growing every day, while the production of electrodes in powder metallurgy and increasing their service life are used in resistance spot welding machines, which are widely used in the automotive industry. In this aspect, the development of effective compositions and technologies for producing copper-based materials produced by powder metallurgy is important, including the characteristics and cost-effectiveness of materials used in the manufacture of electrodes used in resistance spot welding apparatus.

A copper-chromium-based composite alloy consists of brittle chromium and plastic particles of copper. Therefore, as a result of increasing pressing pressure and sintering temperature, an increase in density and a decrease in porosity are observed. With an increase in the percentage of chromium, the hardness and tensile strength also increase. A powder composition with a high density is characterized by a high degree of interparticle interaction, which, in turn, improves in the electrical conductivity of the composite material.

We know that the pressing pressure has the greatest effect on the density of a pressed sample of powder composite alloys. For electrical conductivity testing, samples with a pressing pressure of 400-500 MPa and an sintering temperature of 1100 °C were prepared.



Δ – pressing pressure 400 MPa; × – pressing pressure 450 MPa;
• – pressing pressure 500 MPa.

Figure 1. Effect of chromium content on electrical conductivity of copper-chromium base composite alloy in a state with a sintering temperature of 1100°C.

The temperature in the case when the sintering temperature of the sample is

1100 °C and that is sintering temperature with liquid phase, at this temperature it was possible to obtain the maximum density in all possible ranges of pressing pressure.

From this graph, as a result of the increase in the percentage of chromium in the alloy, the electrical conductivity of the alloy decreases rapidly, and the electrical resistance increases. At the same time, the average results obtained in terms of electrical conductivity were observed in samples made of copper-chromium-based powder composite alloy with a chromium content of 1.5-2.0%.

From the graph obtained in Figure 1, it was found that the electrical conductivity of copper-chromium-based powder composite alloys with a chromium content of 1.5-2.0% gives 70-86% of the electrical conductivity of pure copper. The results of the experiment on the electrical conductivity and electrical resistance of the copper-chromium-based powder alloy are given in Figure 1.

References

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