

UDK 621.762.04:621.316.5

V. A. Kokhanovskiy, PhD in Engineering, Associate Professor
(Igor Sikorsky Kyiv Polytechnic Institute, Kyiv, Ukraine)

IMPROVED METAL-CERAMIC COMPOSITION FOR SWITCHING DEVICES CONTACTS

The problem of replacing cadmium oxide with non-toxic materials is very relevant not only for our country but also globally.

Silver tin oxide (Ag-SnO₂) compositions have been increasingly used in recent years as contact materials instead of silver-cadmium oxide compositions for low-voltage switching devices.

The main drawback of this material is that the working surfaces of the contacts are subjected to oxidation during long-term current passage, which leads to extreme overheating of the materials and a significant increase of transient resistance.

The specified flaw can be overcome by adding special additives to the metal-ceramic composition.

To prevent the formation on the working surface of the oxidized thermo-stable oxide layer was developed a new composite contact material, which includes the following ingredients: 81.5% Ag + 12% SnO₂ + 4% In₂O₃ + 2%Zr + 0.5% WO₃.

The addition of tungsten oxide (WO₃) in the matrix of 0.5% by weight prevents the formation of a thermally stable tin oxide layer with high transient resistance. Molten WO₃ inclusions with relatively low melting point (1470°C) envelop SnO₂ solid particles and form molten silver fibers.

The addition of indium oxide (In₂O₃) to the composition allows the uniform distribution of fine-grained tin oxides in the silver matrix and accelerate the diffusion of tin in the matrix.

The addition of zirconium to the matrix also allows the creation of a composite material with 40% lower electrical erosion than the serial material. This is achieved by absorbing oxygen from molten silver under the electric arc, which reduces the time of its combustion and and liquid silver sprinkling.

On the basis of the research was found composition of the material having a fine-dispersed structure with a uniform distribution of oxides into the matrix. Electro-erosive stability of new material is 1.6 times higher than in serial contacts.