Type of presentation: Poster

MS-4-P-2454 Effects of arcing on the Microstructure, Morphology and Photoelectric Work Function of Ag-ZnO Electrical Contacts.

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Contact materials used for electrical breakers are often made with silver alloys. Mechanical and thermodynamical properties as well as electron emission of such complicated alloys present a lack of reliable and accurate experimental data. At present, new types of contactors with longer duration are marketed, but manufacturers do not understand well why this improvement.
The influence of industrial conditioning (polishing, mechanical shocks and electrical arcs in air) on the microstructure, the composition, and the morphology of internally oxidized Ag-ZnO contacts was investigated. The microstructure, physical properties and electronic emission behavior of Ag-ZnO materials were studied.
Contacts were mounted in a contactor working repeatedly on air (laboratory atmosphere). When submitted to 500 opening electric arcs, the electron work function of an electromechanically conditioned contact Ag-ZnO (92/8), measured photoelectrically by using Fowler’s method of isothermal curves, is F = (4.82 ± 003) eV.
The melting temperature of the zinc oxide is greater than that of silver. Thus, zinc oxide melts after evaporation of silver base material. However, the zinc oxide increases the viscosity of the molten composite and reduced mass losses by radial ejection of the liquid metal. Microanalyses EDS indicate the presence of Ag, Zn, O, C, Al, Si, Cl, ... etc. The additives migrate to the periphery of the contact, as usual. Examination by SEM and and microanalyses by EDS of the conditioned cathode AgZnO have been performed to produce proofs of these phenomena.

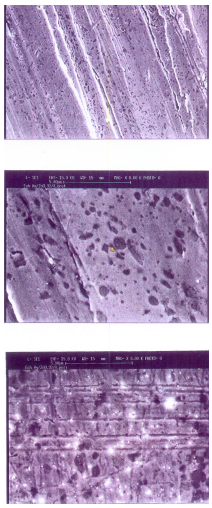

Fig. 1: Micrographs for (a) a virgin and unpolished contact, Ag-ZnO (92/8) SEM magnification x 2000, for (b) a virgin and unpolished contact, Ag-ZnO (92/8) SEM magnification x 8000, and for (c) a virgin and polished contact, Ag-ZnO (92/8) SEM magnification x 8000

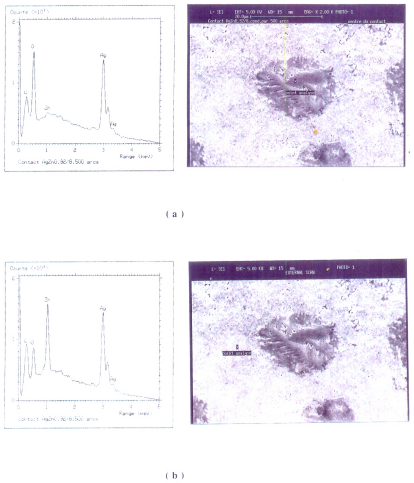

Fig. 2: EDS line scans of two representative points (one bright and one dark) for the central contact surface of the conditioned cathode (500 arcs), Ag-ZnO (92/8). SEM magnification x 2000.

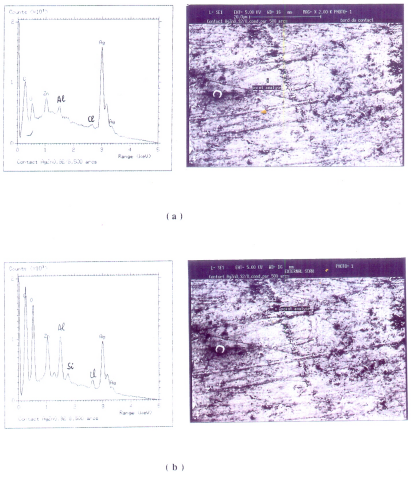

Fig. 3: EDS line scans of two representative points (one bright and one dark) for the peripheral contact surface of the conditioned cathode (500 arcs), Ag-ZnO (92/8). SEM magnification x 2000.