

An Experimental Study on Operating Characteristics of Ag, Pd and Cu Contacts in Argon Atmosphere

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Abstract—In order to investigate influences of surrounding atmospheres on electrical contact phenomena, Ag, Pd and Cu contacts were operated in argon atmosphere up to 30,000 operations to interrupt DC inductive load currents of 1A and 3A at 20V. Arc discharge characteristics (arc duration and voltage waveforms) and contact resistance characteristics during the operations were measured, and the damaged contact surfaces were evaluated with Auger electron microscopy. Furthermore, the damaged contact surfaces (pips and craters) were numerically evaluated with Scanning Laser Microscope (SLM) to measure sizes (diameter, height or depth) of the craters and pips. The measured data were compared with the results obtained in air and in nitrogen atmosphere. Arc duration in argon was in general likely to be longer than that in nitrogen. Contact resistance of the argon samples sometimes showed more fluctuation than the air/nitrogen samples. The SLM observation revealed that the crater size characteristics of the Ag cathode surfaces operated in argon atmosphere with 3A showed similar tendencies to those for the samples operated in air, rather than those in nitrogen. As the results, contrary to the authors' expectation, the operating characteristics in argon atmosphere obtained in this study were in general poorer than those in nitrogen atmosphere.

Keywords - arc; contact resistance; erosion; transfer; argon; nitrogen