

# THE UNUSUAL ELECTRICAL EROSION OF HIGH TUNGSTEN CONTENT, TUNGSTEN COPPER CONTACTS SWITCHING LOAD CURRENT IN VACUUM

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## ABSTRACT

The electrical erosion of high tungsten content, tungsten-copper (7-10 wt. % Cu) was investigated. The contacts were placed in a vacuum interrupter envelope with a background pressure of about  $10^{-6}$  torr. The contacts switched one half cycle of 60 Hz current. The polarity of the current was changed on each operation. Six contact pairs were investigated. Each pair was subjected to an ever-increasing number of operations: 1K, 5K, 10K, 20K, 40K, 50K and 60K. The contact erosion was inferred by measuring the linear position of the moving contact terminal. On completing the electrical testing, the vacuum interrupters were dismantled and the contact surfaces were observed. Unlike the previous work on Ag-WC (50 wt. % Ag) and Cr-Cu (75 wt. % Cu), the W-Cu contacts showed a localized build up of erosion products on the contact surfaces even beginning at 1K operations. The experiments were repeated switching a unidirectional current i.e. the contacts remained at the same polarity throughout the experiments. Here an anode pip and a cathode crater were formed immediately. The different topographies of these contacts is discussed in terms of the metallographic analysis of the deposits on the contacts, the erosion deposits on the shields surrounding the contacts and the expansion of the vacuum arc.

**KEYWORDS:** Tungsten, Copper, Vacuum, Arc, Alternating Current, Direct Current, Switching, Erosion, Cathode Spots