# EXPERIMENTAL STUDY OF HIGH CURRENT VACUUM ARC CHARACTERISTICS AND ANODE ACTIVITIES UNDER AXIAL MAGNETIC FIELDS

Lijun Wang, Liuhuo Wang, Shenli Jia, Zongqian Shi, Dingge Yang, Yu Liu
*State Key Laboratory of Electrical Insulation and Power Equipment, Xi'an Jiaotong University, Xi'an, 710049, China*

In this paper, vacuum arc characteristics and anode melting pool flow phenomena under different experimental conditions are researched and analyzed. Especially, rotational phenomena of anode melting pool are observed and analyzed. Firstly, the influence of different arc currents on arc column appearances, arc modes and anode activities are researched experimentally. Experimental results show that anode becomes very active and anode melting pool rotation phenomena become more significant when arc currents are very high. Then, the influence of electrode configurations (different ratios between gap distances and electrode diameters) on anode activities and melting pool rotation is experimentally investigated (For this case, the gap distance is kept at fixed value, electrode diameter is changed). According to experimental results, anode activities are significantly different for different electrode configurations. For smaller electrode diameters (that means lager ratio, S1 electrode: $D_c$ = 35mm, $D_a$ = 35mm), anode erosion is not located in the center of electrode, which is because axial magnetic fields are not uniform enough to stabilize vacuum arc, rotational phenomena of anode melting pool are not observed. For larger electrode diameters (S2 electrode: $D_c$ = 58mm, $D_a$ = 41mm; S3 electrode: $D_c$ = 58mm, $D_a$ = 58mm), vacuum arc is in the stable status due to the stabilization effect of AMF, anode erosion is mainly located in the center regions of electrode. In this case, stably rotational phenomena of anode melting pool can be found. Compared S2 with S3 electrode, anode erosion and surface deformation in S2 electrode system is more serious and rotational velocity of anode melting pool is larger, which is because the approximately same energy inputs the smaller anode area. Finally, the influence of pure Cu and CuCr30 electrode on anode melting and flow is compared and analyzed. Experimental results show that the anode melt phenomena and melting pool rotation with pure Cu material is more significant than that with CuCr30 material for the same arc current interruption, which will be unfavorable for successful interruption. In interelectrode arc, liquid macroparticle's diameters with Cu material electrode are significantly larger than that with CuCr30 materials.

Electronic mail: lijunwang@mail.xjtu.edu.cn