HIGH-SPEED VIDEO SPECTROSCOPY IN A VACUUM ARC DURING HIGH-CURRENT ANODE MODES

Diego Gonzalez, Steffen Franke, Alireza Khakpour, Ralf Methling, Sergey Gortschakow, Dirk Uhrlandt
[1]Leibniz Institute for Plasma Science and Technology, Felix-Hausdorff-Str. 2, 17489 Greifswald, Germany

ABSTRACT

High-speed video spectroscopy is a valuable tool for examination of temporal characteristics in experiments with limited reproducibility. For this reason it is particularly helpful in the investigation of arcs that occur during a switching-off process in vacuum circuit breakers. Making use of a test vacuum circuit breaker with optical viewports, plasma characteristics during high-current anode modes are investigated. In this contribution it is demonstrated that high-speed video spectroscopy is not only capable of providing qualitative information but can also yield quantitative parameters like radiator densities, electron densities, temperature and pressure.

Specific focus is set on the high-current anode modes, namely anode spot type 1 and anode spot type 2. Furthermore, quantitative densities during the anode plume that appears after extinction of anode spot type 2 are presented. There have been very few studies concerning the anode plume. However, the emission of electrode material close to current zero is a critical phenomenon that attracts significant interest.

High-speed video spectroscopy is supplemented by high-speed video cinematography to record the general arc behavior. Combining spectroscopic tools a more complete picture of physical processes in vacuum arcs relevant for switching applications can be drawn.