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Researches on spectrums and macroscopic forms of DC arc in a short air gap

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Arc accidents may cause serious problems in power grid. Yet, the progress of arc evolution is very complicated and rapidly changed, which can be easily disturbed by external factors. Here, in order better describe DC arc mechanism and exclude external influence factors, a testing platform, which can produce a small DC arc in the condition of gap length less than 15mm and current less than 60mA, was built. Arc evolution and macroscopic forms were captured by a high-speed camera. Spectrums of various states of arc were measured by a multichannel spectrometer and the arc temperatures were calculated based on the spectral lines. The relationships between DC arc resistance and gap length and current were studied. The experimental results show that DC arc develops from the positive electrode rather than negative electrode. With the current increasing, the macroscopic forms of arc evolution progress are mainly consisted of 4 periods: spark, purple-arc, yellow-arc and flame-arc. The arc spectrogram reflects the wavelengths of 4 maximum relative intensities are 315.865 nm, 337.107 nm, 357.649 nm and 391.421 nm, respectively. The relationship between arc resistance and current is a power function, while it is a linear function of gap length. The work in this paper is helpful to understand the progress of DC arc evolution.

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