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Tortuous Spark Paths of SF6 in Non-Uniform Electric Field

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The spark paths of SF6 are tortuous in non-uniform electric field, for the randomness of gas discharge and the influence by the space charge. Meanwhile, the breakdown voltage appears non-monotonous trend with the variation of pressure. This phenomenon is called as corona stabilization because it is caused by the space charge generated by corona discharge. This paper focuses on the relationship between the corona stabilization and the tortuous spark paths. In this paper, we built a spark path observation system by the three-dimensional reconstruction method. The deviation angle of spark paths was used to describe the tortuous degree. The breakdown characteristic under positive DC voltage was measured. The result shows the tortuous degree of the spark paths appears in different breakdown region. In the streamer region, the deviation angle of spark paths is closed to zero, that is, the spark paths are almost perpendicular to the plane electrode. Once the leader discharge appears, the deviation angle increases suddenly. And the deviation angle decreases with the pressure until the breakdown enters the corona-free region. In the corona-free region, the deviation angle depends on the surface topography of the electrode.

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