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Motion Behavior of Free Conducting Wire-type Particles in SF₆ Gas under DC Voltage

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Based on a large number of engineering practices, free conducting particles are unavoidable in GIS, which is largely threaten the security operating of GIS devices compared with fixed conducting particles. Scholars chose sphere particles and air as medium for easy analysis and calculation, which is not agree with practice situation. Therefore, the free conducting particle experiment device and observation system are specially designed and the motion behavior of free wire-type conducting particles in SF₆ gas is studied in this paper. Firstly, the strength model of free wire-type conducting particles and lift-off law are discussed. Furthermore, lift-off electric field strength as a function of gas pressure, shape of particles are researched. The result shows that lift-off electric field strengths are unchangeable with gas pressure; when lengths of particles increase, lift-off electric fields strengths increase slightly. When radius of particles increases, lift-off electric field strengths increase exponentially. Finally, the cohesive strength between particles and electrode, which has an inconvenient effect on particle lift off and often be ignored before, increases as the radius of particles decrease. When the radius of particle is 0.65mm, the cohesive strength is little and even can be neglected in the case of length of particles shorter than 3mm, which makes the calculation value of lift-off electric field strength is similar with the experiment value.

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