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# Analysis of Motion and Discharge of the Free Conducting Wire Particle in DC GIS

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Aiming at restraining the free conducting wire-type particles that are common but dangerous within DC GIS, a more realistic platform of coaxial cylindrical electrode is set up using high-speed camera and PD monitor, in the meanwhile, as to observe the motion, PD and breakdown of the particles. The research work starts from analyzing the charging behavior of the particle under DC voltage, then gives a quantitative analysis and an experimental verification of the particle's lifting voltage. Two different motion patterns of standing and bouncing are observed, and the relations between the probabilities of the two states'occurrence and the length of the particle are studied through experiments. Particle's Corona images are recorded, also, the impulse current method is used to monitor and extract the PD signals which are triggered by the wire-type particles. The breakdown images are also taken, and mechanical analysis of the air–gap breakdown with free conducting wire-type particle is conducted based on the stream theory. The proposed research has shown that, the lifting voltage of the wire particle is almost irrelevant to the length of the particle but has strong correlation with the radius of the particle. The length of the particle has an impact on the motion patterns, i.e. the shorter the particle, the greater the probability of bouncing, and vice versa. There exists micro-discharge corona at the particle's standing point, and the corona at the top of particle renders polarity effects. The intensity and frequency of partial discharge increases with the wire-type particle's length. The micro-discharge gap increases with the length of the wire-type particle, while the breakdown voltage decreases with the length.

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