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Discharge Properties of ETFE Wires for Spacecraft Use

Haruhisa Fujii, Saki Kurata, Kouhei Takeyama and Takashi Nakaoka
Nara National College of Technology, Department of Electrical Engineering
22, Yata-cho, Yamato-koriyama, Nara 639-1080, Japan

The size and the electric capacity of a spacecraft have become larger. So it is necessary to generate and transmit the electric power with higher voltage. As power wires transmitting the electricity are occasionally installed outside the body and/or the solar array paddles of the spacecraft, these wires are possible to be damaged by impacts of space debris and/or heat cycles. Then the conductors of the wires may be exposed to space.

On the other hand, the spacecraft is charged up by space plasma and flashover on the surface may occur. When the surface flashover happens near the exposed conductors of the power wires, the arcing discharge is possible to occur due to generated discharge plasma. The occurrence of this discharge causes malfunctions or damages to the spacecraft.

From this view point, we carried out experiments for insulation evaluation of ETFE insulated wires. We measured the dielectric strength of the ETFE insulator of the wire by DC voltage application. After that, discharge voltage between the wires with partially lacked ETFE insulator was also measured as a function of the pressure. Then the sustained arcing discharges between two lacked ETFE insulated wires triggered by discharge plasma generated by electrostatic discharge (ESD) were investigated. From these results, we discussed the discharge properties of ETFE wires.