

Electron-Beam-Induced Charging of Poly-imide Films

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The electrostatic charging phenomena of poly-imide (Kapton) films used as the thermal control material of spacecraft were investigated by electron-beam irradiation simulating the hot plasma in space. The poly-imide films of the thickness of 13-75 μm were tested under the irradiation conditions of the electron energy E lower than 50keV and the beam current density J_b lower than 1nA/cm². The surface potentials V_s of the films were obtained as functions of E and J_b at the constant irradiation time.

The obtained experimental results were as follows.

(1) V_s increased with increase of J_b . When V_s proportional to J_b^n is assumed, the n value is lower than 0.5.

(2) In V_s - E characteristics, V_s has the peak at some electron energy which is dependent on the thickness.

These results were explained by a one-dimensional charging model in which one charge-deposition layer is assumed to be formed in the bulk of the film and the volume resistivity is considered.

