

Research on relation of sustained arcing on solar array and polyimide thickness

Kyushu institute of technology electrical engineering Hidaka shota

1 Back ground and purpose

In recent years, there is a trend of spacecraft increasing in size and having more functionalities, therefore requiring operation in high-power. In order to transmit power efficiently, higher voltage is essential. As the power level of spacecraft increases, the failure of power system became a big problem. The failure occurred on the solar array when the generation voltage of solar array exceeded 100V. The high voltage can flow the short-circuit current between strings of solar cells with potential difference. The short-circuit current can carbonize an insulation film between cells and form a conducting path. The current generated by the string continues flowing in itself through the conducting path and cannot be transmitted to the spacecraft power system. This failure is called “sustained arc”. We have so far studied about the sustained arc between solar array strings and we found that insulator film between cell and structure of the satellite melts by sustained arc. Thus current flows to structure.

This paper reports on the experimental investigation of relation of sustained arc and insulator film thickness.

2. Experimental Setup

Experimental were performed on dummy samples made of copper and polyimide film thickness. This film insulates the cells from the structure of the satellite, which acts as local ground. We evaluated time until current flows to structure by changing polyimide thickness.

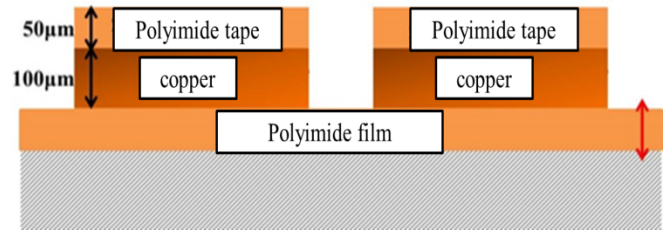


Fig.1 Imitation solar array coupon.

3.Result

As the polyimide thickness increase, duration time also increase. However duration time decrease the thickest polyimide film.

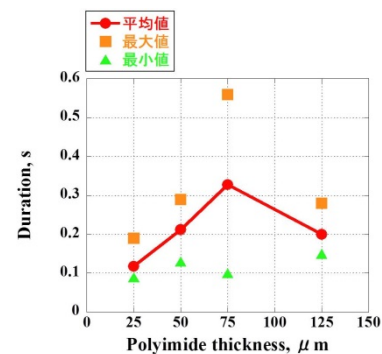


Fig.2 Relation Time until current flows to structure and thickness of polyimide.

4. Conclusion

We found to be resistant against sustained arc by selecting the polyimide film thickness. However duration time decrease the thickest polyimide film. It seems that there is an appropriate thickness of the film.