An Electrically Conductive Thermal Control Surface for Spacecraft Encountering Low-Earth Orbit Atomic Oxygen Indium Tin Oxide-Coated Thermal Blankets

J. L. Bauer

Mechanical and Chemical Systems Division
Jet Propulsion Laboratory
California Institute of Technology

ABSTRACT

Indium tin oxide (ITO) has been coated over an organic black thermal blanket material to prevent blanket degradation in the low-earth orbit (LEO) atomic oxygen environment. The blankets were designed for JPL's Galileo spacecraft destined to orbit and observe Jupiter. Galileo was initially intended for space shuttle launch and would, therefore, have been exposed to atomic oxygen in LEO for between 10 to 25 hours.

Two processes for depositing ITO are described. Thermooptical, electrical, and chemical properties of the ITO film are presented as a function of the deposition process. Results of exposure of the ITO film to atomic oxygen (from a shuttle flight) and radiation exposure (simulated Jovian environment) are also presented. It is shown that the ITO-protected thermal blankets would resist the anticipated LEO atomic oxygen and Jovian radiation yet provide adequate thermooptical and electrical resistance.

Reference is made to the European Space Agency (ESA) Ulysses spacecraft, which also used ITO protection on thermal control surfaces.