Radatox™

FOR SPACE APPLICATIONS

Atomic Oxygen (ATOX) resistant Interconnect solutions

www.axon-cable.com
Materials used on spacecraft exteriors are exposed to a variety of environmental threats that can cause significant degradation. In Low Earth orbit (LEO), these threats include radiation, ultraviolet (UV) radiation, thermal cycling, micrometeoroids, orbital debris impact, and especially atomic oxygen (ATOX). In order to limit the effects of ATOX which erodes and damages materials including polymer insulated wires and cables, Axon Cable has developed a new electrical insulation system called Radatox™.

Radatox™ insulated wires and cables have undergone tests including Atomic Oxygen erosion and ageing in space-like simulated conditions (radiation, UV and thermal cycling) led by independent laboratories including ESA ESTEC TEG-QEE lab.

Radatox™ based pressure sensitive tapes (PST) survive the harsh, on-ground evaluation test plan without any noticeable cracking or degradation of properties after 200 Mrad irradiation followed by UV exposure up to 6000 ESH and finally 100 thermal cycles in vacuum between [-150 +150]°C. Thermo-optical properties have also been measured at each of the ageing stages.

Radatox™ insulated wires and cables to areas that are protected from ATOX. Solutions exist on the market to protect organic materials including wire and cable shields from ATOX damages such as Kapton® (1) (Radatox™ ATOX erosion yield = 2 x 10**10 cm2/atom).

In space, solar radiation has enough energy to break apart oxygen (O2) molecules and create atomic oxygen (O). This very abundant particle, particularly present at altitudes from 180 km to 650 km, erodes and damages many materials including most polymers and even some metals including silver.

The lower the altitude, the higher the ATOX density and its effects. Multi-Layer Insulation (MLI) blankets, solar panels and wires and cables located on spacecraft exteriors are all susceptible to this threat. ATOX erosion limits the service life of the components and therefore of the mission. Protection against atomic oxygen is, therefore, a key challenge for the space industry.

Applications & Products
New Radatox™ solutions are already available for round wires and cables. Flat Flexible Cable (FFC) prototypes with Radatox™ protection have also been developed.

Principal potential applications for Radatox™ insulation include wires and cables, antennae, solar array cabling, adhesive tapes and a potential further application in MLI Thin films (925m) and Pressure Sensitive Tapes (PST): Radatox™ combined with low outgassing space grade adhesives.

Alternative ATOX Resistant Solutions
Radatox™ is an optimized, mass saving solution for spacecraft operating in LEO orbits, particularly those below 600 km. But for missions for which mass saving and material erosion are less critical, Axon® Cable also offers ESA qualified wires and cables (ESCC 3901/018 and ESCC 3901/024) which already present some resistance to ATOX. This mainly concerns satellites in higher altitudes where ATOX density is lower or for shorter mission lifetimes (less than 5 years).

MATERIALS COMPARISON: RADATOX™ AT THE FOREFRONT

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