

## Spacecraft nonmetal materials resistance to effect of space environment

Novikov L. S.

(Skobeltsyn Institute of Nuclear Physics Moscow State University, Moscow 119992, Russia)

Polymer and composite materials, optical glasses, enamel coatings etc. are widely used in spacecraft construction. These materials have lower radiation resistance in comparison with the majority of metals and alloys. Besides, nonmetal materials, especially polymer materials used on the spacecraft outer surface may change the properties significantly under the effect of atomic oxygen of the upper Earth's atmosphere and ultraviolet radiation of the Sun. Also, important problem is accumulation of electric charges on surface and in volume of dielectric materials under the influence of the space environment.

So, complex studies of nonmetal material resistance to effect of the space environment are necessary. The studies should include: (1) laboratory tests of materials; (2) mathematical modeling of materials degradation processes, and development of mathematical models for prediction of the material properties change; (3) development of methods for the material protection in the space environment.

In the paper, following items are considered: performances of the space factors making the greatest effect on nonmetal materials, physical mechanisms of the various effects, methods of laboratory tests of nonmetal materials, methods of mathematical modeling of the exterior factors action on dielectrics, methods of the material protection against the space environment effect. Experimental and computation data describing the material stability in space are presented. Recommendations for use of various nonmetal materials in the spacecraft construction are given.