Paper ID: 49106
student

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Environmental Effects and Spacecraft Protection (6)

Author: Mr. Daniel Nono
INPE - Natiional Institute for Space Research, Brazil

BIOMIMETICS APPLIED IN MICRO METEOROIDS AND SPACE RADIATION SHIELDS DESIGN FOR ARTIFICIAL SATELLITES PROTECTION

Abstract

The space environment is hostile to spacecraft due to space radiation and space debris, natural and man-made. The materials used in construction suffer degradation caused by ionizing radiation, particle impact and thermal cycling. Particularly electronic components can degrade and even fail definitively due to ionizing radiation. The design of an efficient shielding should take into account the effectiveness as well as the applied mass, since one of the launch cost factors is the mass of the satellite. The design of spatial artifacts offers a large field of technical challenges for materials researchers. Sources of inspiration are rare, mainly due to the technical secrecy inherent in the sector. This paper discusses and analyzes the use of biomimetics in solutions of space materials. The work sought to promote and disseminate the use of this tool as inspiration for space applications. For this, the researchers did made consultations in literature data bases and Patent data bases of some uses of biomimetics and analyzed the shield design problem with the scientific method of comparison with a bacteria protection system. Then the modeling of a multi-layer structure was proposed and discussed. The solution found shows that it is possible to develop adequate protection, mimicking the protection structure of the bacteria. This solution was chosen because bacteria are great travelers, just like satellites, covering great distances in relation to the size of the body. The researchers concluded that biomimetics is a valid tool and should be widespread in space projects and can be used as a source of inspiration.