

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

Author: Prof. Roman Ya. Kezerashvili  
New York City College of Technology, United States, rkezerashvili@citytech.cuny.edu

A SOLAR SAIL COATED BY MATERIALS THAT UNDERGO DESORPTION FOR A SPACE  
EXPLORATION

**Abstract**

In this paper is suggested to use space environmental effect such as the solar radiation heating to accelerate a conventional solar sail for an extrasolar space exploration. Kinematics of a solar sail coated by materials that undergo desorption at a particular temperature as a result of heating by the solar radiation is studied. We developed approach that allows determine the perihelion of the solar sail orbits based on the temperature requirement for the solar sail materials and obtain a peak perihelion temperature for the solar sail that is coated by two coats of the materials that disorp at a different temperature of the solar sail depending on the heliocentric orbits. The first desorption occurs at a particular heliocentric orbit and provides the trust to the solar sail. When solar sail approaches to the sun its temperature increases and the second coat undergoes desorption at the perihelion of the heliocentric escape orbit by providing the second trust to the solar sail. This acceleration boosts the solar sail at its escape velocity. However, it will continue the accelerated motion due to the solar radiation pressure. Therefore, the solar sail in addition to the conventional acceleration by the solar radiation pressure will undergo two accelerating stages through desorption of the coated materials. The scenario of a mission to the Sun's gravitational focus to verify general relativity predictions [1] and to explore particles and fields in the Sun's inner Oort Comet Cloud.

[1] R. Ya. Kezerashvili, J. F. Vazquez-Poritz, *Acta Astronautica*, 83 (2013) 54–64