

# Accepted Manuscript

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PII: S0094-5765(17)31055-X

DOI: [10.1016/j.actaastro.2018.02.024](https://doi.org/10.1016/j.actaastro.2018.02.024)

Reference: AA 6719

To appear in: *Acta Astronautica*

Received Date: 28 July 2017

Revised Date: 22 November 2017

Accepted Date: 14 February 2018

Please cite this article as: N. Shimosako, Y. Hara, K. Shimazaki, E. Miyazaki, H. Sakama, Effects of atomic oxygen on titanium dioxide thin film, *Acta Astronautica* (2018), doi: 10.1016/j.actaastro.2018.02.024.

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# Effects of Atomic Oxygen on Titanium Dioxide Thin Film

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## Abstract

In low earth orbit (LEO), atomic oxygen (AO) has shown to cause degradation of organic materials used in spacecrafts. Similar to other metal oxides such as SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> and ITO, TiO<sub>2</sub> has potential to protect organic materials. In this study, the anatase-type TiO<sub>2</sub> thin films were fabricated by a sol-gel method and irradiated with AO. The properties of TiO<sub>2</sub> were compared using mass change, scanning electron microscope (SEM), atomic force microscope (AFM), X-ray photoelectron spectroscopy (XPS), X-ray diffraction (XRD), transmittance spectra and photocatalytic activity before and after AO irradiation. The results indicate that TiO<sub>2</sub> film was hardly eroded and resistant against AO degradation. AO was shown to affect only the surface of a TiO<sub>2</sub> film and not the bulk. Upon AO irradiation, the TiO<sub>2</sub> films were slightly oxidized. However, these changes were very small. Photocatalytic activity of TiO<sub>2</sub> was still maintained in spite of slight decrease upon AO irradiation, which demonstrated that TiO<sub>2</sub> thin films are promising for elimination of contaminations outgassed from a spacecraft's materials.

**Keywords:** Atomic oxygen, Titanium dioxide

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