Performance of liquid SiO2 coating for reinforcement of thermal control surface

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ABSTRACT

An SiO2 coating has been extensively used to reinforce surface durability of a base material in ground applications: an LCD panel of a smart phone, for example. There is a liquid type SiO2 coating, and it is very easy to apply on a base material in a room environment. Very good durability can be obtained. Although a surface of spacecraft is handled with care, it is sometimes damaged. The surface reinforcement is desired for a fragile surface such as an inorganic white paint. An organic material is eroded by the atomic oxygen (AO) in a low earth orbit. An SiO2 coating is expected to protect a base material from AO. The present paper will show the durability and the degradation property of a liquid type SiO2 coating. We applied the liquid type SiO2 coating on (1) an inorganic white paint, and (2) a black polyimide film. The materials were irradiated by UV and AO.

The SiO2 coating on the white paint increased in solar absorptance after UV irradiation: The solar absorptance of the SiO2 coated white paint increases more than that of the white paint without SiO2 coating. As for AO, the SiO2 coating protected the black polyimide film from AO: The black polyimide with the SiO2 coating decreased in mass less than that without the SiO2 coating by AO irradiation. The liquid type SiO2 coating protects the base material from AO irradiation, but it is degraded by UV irradiation. The improvement of the coating is desirable and in progress.