

Atomic Oxygen Durability Evaluation of a UV Curable Ceramer Protective Coating



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Evaluation of a UV Curable
Ceramer Protective Coating

NASA Technical Reports Server
(NTRS), et al., Bruce A. Banks

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Reviews

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(Prof. Johnson Rutherford)

ATOMIC OXYGEN DURABILITY EVALUATION OF A UV CURABLE CERAMER PROTECTIVE COATING

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Bibliogov, United States, 2013. Paperback. Book Condition: New. 246 x 189 mm. Language: English . Brand New Book ***** Print on Demand *****.The exposure of most silicones to atomic oxygen in low Earth orbit (LEO) results in the oxidative loss of methyl groups with a gradual conversion to oxides of silicon. Typically there is surface shrinkage of oxidized silicone protective coatings which leads to cracking of the partially oxidized brittle surface. Such cracks widen and branch crack with continued atomic oxygen exposure ultimately allowing atomic oxygen to reach any hydrocarbon polymers under the silicone coating. A need exists for a paintable silicone coating that is free from such surface cracking and can be effectively used for protection of polymers and composites in LEO. A new type of silicone based protective coating holding such potential was evaluated for atomic oxygen durability in an RF atomic oxygen plasma exposure facility. The coating consisted of a UV curable inorganic/organic hybrid coating, known as a ceramer, which was fabricated using a methyl substituted polysiloxane binder and nanophasse silicon-oxo-clusters derived from sol-gel precursors. The polysiloxane was functionalized with a cycloaliphatic epoxide in order to be cured at ambient temperature via a cationic UV induced curing mechanism. Alkoxy silane groups were also grafted onto the polysiloxane chain, through hydrosilation, in order to form a network with the incorporated silicon-oxo-clusters. The prepared polymer was characterized by H-1 and Si-29 NMR, FT-IR, and electrospray ionization mass spectroscopy. The paper will present the results of atomic oxygen protection ability of thin ceramer coatings on Kapton H as evaluated over a range of atomic oxygen fluence levels.

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