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Low Earth Orbital Atomic Oxygen Interactions with Materials

By Bruce A. Banks

BiblioGov. Paperback. Book Condition: New. This item is printed on demand. Paperback. 30 pages. Dimensions: 9.7in. x 7.4in. x 0.1in. Atomic oxygen is formed in the low Earth orbital environment (LEO) by photo dissociation of diatomic oxygen by short wavelength (243 nm) solar radiation which has sufficient energy to break the 5. 12 eV O₂ diatomic bond in an environment where the mean free path is sufficiently long (108 meters) that the probability of reassociation or the formation of ozone (O₃) is small. As a consequence, between the altitudes of 180 and 650 km, atomic oxygen is the most abundant species. Spacecraft impact the atomic oxygen resident in LEO with sufficient energy to break hydrocarbon polymer bonds, causing oxidation and thinning of the polymers due to loss of volatile oxidation products. Mitigation techniques, such as the development of materials with improved durability to atomic oxygen attack, as well as atomic oxygen protective coatings, have been employed with varying degrees of success to improve durability of polymers in the LEO environment. Atomic oxygen can also oxidize silicones and silicone contamination to produce non-volatile silica deposits. Such contaminants are present on most LEO missions and can be a threat to performance...



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