

Interaction of upper atmospheric composition of planets and functional materials used in satellites

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A spacecraft orbiting a planet encounters high-energy collisions against molecules consisting upper atmosphere of the planet. Even though pressure in orbit is quite low, typically 10^{-4} Pa, a high-orbital velocity of spacecraft, a few km/s, results in collision density high-enough for changing surface properties of spacecraft materials. In case of a earth observing spacecraft orbiting 250 km from a sea level experiences collision with atomic oxygen, which is a major component of upper atmosphere of the earth, as high as 10^{15} atoms/cm²/s. The collision density, or flux, of 10^{15} atoms/cm²/s corresponds to surface atomic density of solid surfaces, thus a surface atom experiences a collision in every second. When a reaction product has high vapor pressure, it vaporizes and surface function of the material is lost. In this presentation, we consider the effect of high-energy collision of atmospheric molecules with spacecraft, especially atomic oxygen effect on earth observing satellites.