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Microsatellite Passive Thermal Design Using Anodized Titanium

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Abstract : Microsatellites' low available power limits the usage of active thermal control techniques in these categories of satellites. Passive thermal control techniques are preferred due to their high reliability and power saving which increase the satellite's survivability in orbit. Steady-state and transient simulations are applied to the microsatellite design in order to define severe conditions in orbit. Satellite thermal orbital three-dimensional simulation is performed using thermal orbit propagator coupled with Comsol Multiphysics finite element solver. Sensitivity study shows the dependence of the satellite temperatures on the internal heat dissipation and the thermooptical properties of anodization coatings. The critical case is defined as low power orbiting mode at the eclipse zone. Using black anodized aluminum drops the internal temperatures to severe values which exceed the permissible cold limits. Replacement with anodized titanium returns the internal subsystems' temperatures back to adequate temperature fluctuations limits.

Keywords : passive thermal control, thermooptical, anodized titanium, emissivity, absorbtiviy
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