

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Specialized Technologies, Including Nanotechnology (8)

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THERMAL CONTROL DESIGN OF HIGH-POWER SMALL SATELLITE ORBITING MARS

Abstract

The UAE has set a long term to establish a settlement in Mars by 2117. The development of first mission to Mars with an orbiter scheduled to launch in July-2020. More missions will be planned to achieve the ultimate goal of the 100 years plan. With the development of space technologies, small satellites i.e. CubeSats have been contributing easier access to the space, advanced scientific exploration and reduced mission costs, along with being approved to be capable for deep space missions. High-power small satellites have the potential to provide new and advanced capabilities in exploring the deep-space; however, the thermal management brings significant challenges to apply these capabilities in small satellites where the thermal dissipation technologies are still lacking. This research aims to analyse and propose a new concept for heat dissipation using nanofluids in a loop heat pipe with a deployable radiator for deep space exploration mission i.e. Planet Mars. While these techniques have been demonstrated on larger satellites, the current trend is to develop a miniaturized system for small satellite applications. The addition of nanoparticles to conventional heat transfer fluid can dramatically increase its thermal performance due to the increased thermal conductivity of the nanoparticles, whereas the deployable radiator will offer significant enhancements in the thermal dissipation due to increase in the radiating area. This analysis were performed on a 6U CubeSat model, with generic CubeSat components