

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

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THERMAL DESIGN EVALUATION OF LOOP HEAT PIPE FOR SMALL SATELLITE
APPLICATIONS USING GRAPHENE NANO-PARTICLES

Abstract

With the development of space technologies, small satellites have been contributing easier access to the space, advanced scientific exploration and reduce mission costs. In future, number of small satellite applications is expected to grow dramatically. Miniaturized thermal management systems are required to ensure thermal control requirements are met. High-power small satellites have the potential to provide new and advanced capabilities; 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 analyze and propose a new concept for heat dissipation through using graphene based heat transfer fluid in a loop heat with a deployable radiator design using simulation analysis. While these techniques have been demonstrated on larger spacecraft, an additional development for miniaturization an testing for small satellite applications. The addition of graphene 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 a significant enhancement in the thermal dissipation due to increase in the radiators surface area. The analysis will be performed on 6U cubesat model, and the results will be validated with experiments and obtained data from literature. Based on the results, the technology demonstration might take place in future CubeSat mission.