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EXPERIMENTAL AND NUMERICAL STUDY ON THE PCM THERMAL CONTROL DEVICE FOR
SPACECRAFT ELECTRONICS**Abstract**

Using solid-liquid phase change materials (PCM) for thermal control of periodically or intermittently operating electronic module is very efficient in terms of weight and size optimization. When the PCM is applied for thermal control it should be considered as design constraints not only shape and operating characteristics of the module but also mechanical and thermal environments around the module. Therefore, the design using PCM is typically one-time, and application of technical heritages are limited. In this study, we designed and manufactured a PCM thermal control device that can control the temperature effectively by connecting heat pipe, as a thermal path, between the module and radiator and installing the PCM to the heat pipe in parallel. In such design, only amount of PCM is adjusted according to heat dissipation and operating time of the module, and the whole configuration is not changed, so that the design continuity can be maintained. Thermal vacuum tests were performed on the manufactured thermal control assembly including the simulated heat generation module, and it was verified that very efficient temperature control is possible. Numerical analyses were also performed and the results were compared with the experiments. The accuracy of the numerical analyses were verified, and as a result it can be applied to thermal design of the new programs.