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

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PHASE CHANGE MATERIAL DEVICE FOR SPACECRAFT THERMAL CONTROL

Abstract

On board a satellite, the experiments and subsystems have to be maintained within specified temperature limits. Phase Change Materials (PCM) offer the possibility to store thermal energy directly as latent heat of fusion. Usually, the melting PCMs can easily be used in reversible, closed systems. Two advantages of a PCM device are the stability of temperature control and the absence of moving parts. The heat-storage requirement is mainly defined by the duty cycle along the orbital period. A trade-off is presented for typical missions, which takes into account the temperature range, the weight and thermal conductivity of the PCM device together with the specific design of the container. Candidates PCM for space applications are reviewed according to their main characteristics such as latent heat, phase transition temperature, conductivity, density but also corrosion potential, hysteresis and ageing. Results of a parametric study are presented with an evaluation of future work including testing of a prototype.