

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Vehicles – Mechanical/Thermal/Fluidic Systems (7)

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TRANSIENT STUDY ABOUT THE HEAT TRANSFER OF SUBLIMATOR COMBINED WITH
FLUID LOOP

Abstract

Sublimator is a good candidate to be used as supplemental heat sink of thermal control system for the spacecraft to reject short period large heat load. In this paper, we analyze the transient work performance of sublimator firstly, then present a detailed transient heat transfer model of a spacecraft pumped fluid loop thermal control system(PFLTCS), which employs sublimator as the supplemental heat rejection device. This paper also presents a model of a simulative fluid loop system(SFLS), which is used to test the sublimator performance instead of the integrated PFLTCS. The transient equations of PFLTCS and SFLS are solved via numerical method. The solutions reveal the transient variation of the key parameters of sublimator and the fluid loop, including temperature, feed water mass flow rate, phase change front. In addition, experiment results of a sublimator coupon are also provided to validate the computational results. Experiment results show that the transient model can predict the transient characteristics of sublimator and the fluid loop system during the sublimator startup. The computational results also indicate the transient performances of PFLTCS match the SFLS well.