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# TRANSIENT NUMERICAL SIMULATION ON THE PERFORMANCE OF A NEON-CHARGED CRYOGENIC LOOP HEAT PIPE FOR SPACE APPLICATION

**Abstract**

A transient mathematical model for cryogenic loop heat pipe (CLHP), which possesses high pumping capability and good heat transfer performance that are important for effective and efficient cryogenic heat transport with considerable applications in space and terrestrial surroundings, is established and used to study the performance of a neon-charged CLHP (Ne-CLHP) in the present work. The numerical results are benchmarked with experimental data and a good agreement is achieved. The effects of parasitic heat loss, charged pressure of the working fluid, and heat sink temperature on the performance of the Ne-CLHP are conducted under a constant heat loads applied to the secondary evaporator (1.5 W), which is selected based on the previous experimental study. Based on the numerical results, it is found that the heat sink temperature affects slightly the resistance loss of the system, but markedly the wall temperature of primary evaporator and the maximum heat transport capability. There existed an optimum charged pressure of the working fluid to achieve the maximum heat transport capability. The detailed temperature and pressure characteristics of the Ne-CLHP are also captured which can provide a better understanding of the inherent mechanisms responsible for the phenomena and then provide guidance for the design and optimization of Ne-CLHPs, which can realize efficient cryogenic heat transport in the temperature range of 30–40 K, and promises great application potential in the thermal control of future space infrared exploration system.