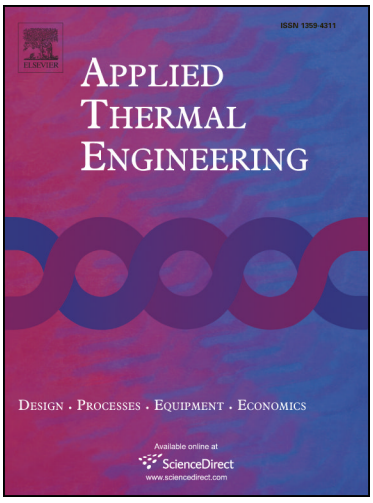

Meter-Scale Multi-Loop Capillary Heat Pipe

Shun Okazaki, Hideyuki Fuke, Hiroyuki Ogawa, Yoshiro Miyazaki, Katsumasa Takahashi, Noboru Yamada

PII: S1359-4311(18)30228-X
DOI: https://doi.org/10.1016/j.applthermaleng.2018.05.116
Reference: ATE 12255

To appear in: *Applied Thermal Engineering*

Received Date: 12 January 2018
Accepted Date: 26 May 2018

Please cite this article as: S. Okazaki, H. Fuke, H. Ogawa, Y. Miyazaki, K. Takahashi, N. Yamada, Meter-Scale Multi-Loop Capillary Heat Pipe, *Applied Thermal Engineering* (2018), doi: https://doi.org/10.1016/j.applthermaleng.2018.05.116

Meter-Scale Multi-Loop Capillary Heat Pipe

Shun Okazaki[a], Hideyuki Fuke[a,*], Hiroyuki Ogawa[a], Yoshiro Miyazaki[b], Katsumasa Takahashi[c], Noboru Yamada[c]

[a] *Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency (JAXA/ISAS), Sagamihara, Kanagawa 252-5210, Japan*
[b] *Thermal Control Laboratory Inc., Fukui, Fukui 910-0017, Japan*
[c] *Nagaoka University of Technology, Nagaoka, Niigata 940-2188, Japan*

Abstract

In this study, a newly proposed heat pipe system was investigated to transfer heat from a vertical heated plate to a vertical cooled plate arranged in parallel. The heat pipe system comprises 32 loops connected in series and a reservoir. Each square-shaped loop (with a side length of 2 m) comprises a capillary tube with an inner diameter of 1.0 mm without any internal wick. The system's overall thermal performance was investigated at room temperature using R410A as the working fluid. Temperatures, pressures, and reservoir weight were monitored, and thereby confirming that the system transfers heat up to several hundred watts by a passive two-phase flow. Numerical simulations with a simple model were consistent with the data and verified that the saturated pressure of the system is controlled by the reservoir temperature independent of the amount of heat load.

Keywords: Cooling System Design; Two-Phase Flow; Homogeneous Flow; Variable Conductance; Thermosyphon

1. Introduction

Developments in electronic devices have led to the emergence of diverse requirements to handle the heat generated by electronics [1, 2, 3]. For example, locally concentrated heat must be absorbed in a few instances while a large amount of heat must be treated in certain instances. In each instance, it is

*Corresponding author
Email address: fuke.hideyuki@jaxa.jp (Hideyuki Fuke)