

Influence of Gravity on the Performance of Closed Loop Pulsating Heat Pipe

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Abstract : Closed Loop Pulsating Heat Pipe (CLPHP) is a passive two-phase heat transfer device having potential to achieve high heat transfer rates over conventional cooling techniques. It is found in electronics cooling due to its outstanding characteristics such as excellent heat transfer performance, simple, reliable, cost effective, compact structure and no external mechanical power requirement etc. Comprehensive understanding of the thermo-hydrodynamic mechanism of CLPHP is still lacking due to its contradictory results available in the literature. The present paper discusses the experimental study on 9 turn CLPHP. Inner and outer diameters of the copper tube are 2 mm and 4 mm respectively. The lengths of the evaporator, adiabatic and condenser sections are 40 mm, 100 mm and 50 mm respectively. Water is used as working fluid. The Filling Ratio (FR) is kept as 50% throughout the investigations. The gravitational effect is studied by placing the evaporator heater at different orientations such as horizontal (90 degree), vertical top (180 degree) and bottom (0 degree) as well as inclined top (135 degree) and bottom (45 degree). Heat input is supplied in the range of 10-50 Watt. Heat transfer mechanism is natural convection in the condenser section. Vacuum pump is used to evacuate the system up to 10^{-5} bar. The results demonstrate the influence of input heat flux and gravity on the thermal performance of the CLPHP.

Keywords : CLPHP, gravity effect, start up, two-phase flow

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