

**EXPERIMENTAL AND NUMERICAL
INVESTIGATIONS OF LOOP HEAT PIPE
PERFORMANCE WITH NANOFLUIDS**

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LOOP HEAT PIPE PERFORMANCE WITH NANOFLUIDS**

by

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LIST OF SYMBOLS

English Symbols

A	Area, m ²
A _B	Area of base plate, m ²
A _f	Surface area of aluminum rectangular fin, m ²
A _h	Cross-sectional area of LHP, m ²
Al ₂ O ₃	Aluminum oxide
C _p	Specific heat, J/kg.K
Fe ₂ NiO ₄	Iron nickel oxide
g	Acceleration of gravity, m ² /s
h	Heat transfer coefficient, W/m ² .K
h _{fc}	Heat transfer coefficient at forced convection, W/m ² .K
h _{nc}	Heat transfer coefficient at natural convection, W/m ² .K
H ₂ O	Water
k _{air}	Thermal conductivity of air, W/m.K
k _s	Solid thermal conductivity, W/m.K
k _{eff}	Effective thermal conductivity, W/m.K
k _{eff, E}	Effective thermal conductivity of evaporator, W/m.K
k _{eff, L}	Effective thermal conductivity of liquid line, W/m.K
k _{eff, v}	Effective thermal conductivity of vapor line, W/m.K
L _C	Condenser section length, mm
L _E	Evaporator section length, mm
L _L	Liquid line length, mm
L _V	Vapor line length, mm

n	Direction normal to the wall
\mathbf{n}	Direction normal to the surface element
P	Pressure, Pa
P_{in}	Pressure inlet, Pa
P_{out}	Pressure outlet, Pa
Pr	Prandtl number
P_w	Pure water
ΔP	Pressure drop, Pa
Q	Heat input, W
q	Heat flux, W/m ²
Q^*	Coolant flow rate, m ³ /s
R	Thermal resistance, °C/W
R_B	Base thermal resistance, °C/W
R_C	Convective thermal resistance, °C/W
R_E	Evaporator thermal resistance, °C/W
R_V	Vapor line thermal resistance, °C/W
R_L	Liquid line thermal resistance, °C/W
R_T	Total thermal resistance, °C/W
SiO_2	Silicon dioxide
T	Temperature, °C
T_{in}	Inlet temperature
t	Time, s
T_A	Ambient temperature, °C
T_B	Base plate temperature, °C
T_C	Condenser temperature, °C

T_E	Evaporator temperature, °C
T_V	Vapor line temperature, °C
T_L	Liquid line temperature, °C
T_w	Wall temperature, °C
T_s	Solid temperature, °C
u	Fluid velocity, m/s
u_{in}	Inlet fluid velocity, m/s
x, y, z	Space coordinates

Greek Symbols

β_0	Constant coefficient
β_j	Interaction coefficient of linear
β_{ij}	Interaction coefficient of the second-order terms
β_{jj}	Interaction coefficient of quadratic
ε	Error
k	Number of independent variables
μ	Dynamic viscosity, Ns/m ²
ρ	Density, kg/m ³
σ	Surface tension, N/m
φ	Particle mass concentration, %

Subscripts

<i>bf</i>	Base fluid
<i>nf</i>	Nanofluid
<i>in</i>	Inlet
<i>out</i>	Outlet
<i>p</i>	Particle
<i>s</i>	Solid
<i>w</i>	Wall