Abstract

This report is focus on heat transfer characteristic advanced loop thermosyphon with check value (ALT/CV) containing nanofluids. It will highlight theories for investigating heat transfer characteristic. Points of importance will be emphasize, with significance given to the heat transfer characteristics of ALT/CV and their use in this experiment. The chapter I present work aims to study the effects of operating temperature, loop and check valve on thermal performance of nanofluids in an ALT/CV. The chapter II present theoretical consideration to study the thermosyphon, heat transfer characteristics, dimensionless, nanofluids and surfactant. The chapter III describes the results and discussions of silver nanofluids properties when preparing for filled as working fluids in ALT/CV. It is divided into a number of sections to determine the thermal properties of silver nanofluids containing surfactant. The chapter IV describes the heat transfer rate behaviour of an advanced loop thermosyphon with check valve(ALT/CV) which is filled with silver nanofluids and containing oleic surfactant (OA) and potassium oleate surfactant (OAK+). Also included are the explanation of dimensionless and the behaviour characteristics in the ALT/CV. The filling ratios are 30, 50 and 80% with respect to evaporator volume. The heat was supplied of 20%, 40%, 60%, 80% and 100% of heater (2,000 Watt). Five working fluids are: deionized water, deionized water based silver nanoparticles concentration of 0.5 wt% (NP), NP containing 0.5, 1 and 1.5 wt% of OA and OAK+ respectively. The dimensionless parameters on ALT/CV are such as $\frac{Lo_{size}}{D_i}$, Pr, Bo, Ja, Co, Cd, Ga_m, Pe_m, Ar, Gr and Z. Then, all of dimensionless was to create a correlation equation with Kutaeladze number for predicting heat transfer of ALT/CV, shows as below;

$$q = 3.24\left[\frac{Lo_{size}}{D_i}^{6} \cdot \frac{\mathrm{Pr}^{6.2} \cdot Bo^{6.4} \cdot Ja^{6.2} \cdot Co^{5.2} \cdot Cd^{3.8} \cdot Ga_m^{1.5}}{Pe_m^{2.7} \cdot Ar^{0.4} \cdot Z^{0.2} \cdot Gr^{0.6}}\right]^{1.57} \times \left[\rho_v h_{fg}\left(\frac{\rho_v - \rho_l}{\rho_v^2}\right)\right]^{0.25}$$

The correlation equation is used to calculate and construct a design for the oven installed with ALT/CV (OALT/CV) shows in Chapter V.