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## Boiling and condensation heat transfer of inclined two-phase closed thermosyphon with various filling ratios

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### Abstract

The effect of the filling ratio and inclination angle on boiling and condensation heat transfer of the two-phase closed thermosyphon (TPCT) was experimentally investigated using water as a working fluid. The TPCT has the inner diameter of 25 mm and consists of evaporator, adiabatic and condenser sections which are 300, 300 and 325 mm long, respectively. Local wall temperatures of both upper and lower surfaces are measured to identify the variation of heat transfer coefficient based on the circumferential location. The inclination angle varies from 5° (near horizontal) to 90° (vertical) and the filling ratio is changed from 0.25 to 1.0, respectively. Boiling heat transfer coefficient in the TPCT is higher than the Rohsenow correlation at the low heat flux below 100 kW/m<sup>2</sup> due to vigorous liquid fluctuation at the evaporator, but it becomes lower than the correlation at the higher heat flux because of the partial dry-out resulting from the large amount of vapor bubbles. Condensation heat transfer coefficient is higher than the Nusselt correlation at the low heat flux, but once the stable condensate film is formed on the surface, it has good agreement with the correlation. The present two-phase closed thermosyphon shows the best thermal performance at the inclination angle of 30° and the filling ratio of 0.5.

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