

Numerical Investigation of Nanofluid Based Thermosyphon System

Authors : Kiran Kumar K., Ramesh Babu Bejjam, Atul Najan

Abstract : A thermosyphon system is a heat transfer loop which operates on the basis of gravity and buoyancy forces. It guarantees a good reliability and low maintenance cost as it does not involve any mechanical pump. Therefore it can be used in many industrial applications such as refrigeration and air conditioning, electronic cooling, nuclear reactors, geothermal heat extraction, etc. But flow instabilities and loop configuration are the major problems in this system. Several previous researchers studied that stabilities can be suppressed by using nanofluids as loop fluid. In the present study a rectangular thermosyphon loop with end heat exchangers are considered for the study. This configuration is more appropriate for many practical applications such as solar water heater, geothermal heat extraction, etc. In the present work, steady-state analysis is carried out on thermosyphon loop with parallel flow coaxial heat exchangers at heat source and heat sink. In this loop nano fluid is considered as the loop fluid and water is considered as the external fluid in both hot and cold heat exchangers. For this analysis one-dimensional homogeneous model is developed. In this model, conservation equations like conservation of mass, momentum, energy are discretized using finite difference method. A computer code is written in MATLAB to simulate the flow in thermosyphon loop. A comparison in terms of heat transfer is made between water and nano fluid as working fluids in the loop.

Keywords : heat exchanger, heat transfer, nanofluid, thermosyphon loop

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