ABSTRACT

Jet impingement is one of the best methods of achieving a particularly high heat transfer enhancement and is therefore used in many engineering applications. In order to obtain high thermal performance, the use of different geometries of the target plates can be employed for this purpose.

In the present study, the heat transfer, fluid flow and entropy generation of a confined slot jet impingement with SiO_2-water nanofluid have been numerically investigated. Three different geometries shapes such as circular, triangular and trapezoidal rib, which mounted on the target surface are considered. The smooth target plate is examined as well. Effects of rib heights, the distance between a rib and the stagnation point, Reynolds number and the jet-to-plate spacing on the flow and thermal fields are presented and discussed. The numerical simulations are conducted for the Reynolds number and nanoparticles volume fraction in the ranges of 200-1000 and 0 - 4 %, respectively. The governing continuity, momentum, and energy equations have been solved using the finite volume method based on the SIMPLE algorithm.

It was found that the average Nusselt number, total entropy generation and the thermal-hydraulic performance increase with Reynolds number and nanoparticles volume fraction increases for all shapes of ribs. In addition, it is found that the heat transfer enhancement using a target plate with different shapes of ribs is higher than that of the smooth target surface. Furthermore, the average Nusselt number and entropy generation increased with increasing the rib heights while the best performance factor is provided by