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| Title | Second law analysis for free convection in an L-shaped cavity filled with nanofluid | | |
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| Abstract |  |
| Natural convection heat transfer occurs in engineering applications like solar thermal collectors, electronic device cooling, nuclear reactors, etc. This paper aims to analyze the heat transfer and entropy generation in free convection laminar flow of nanofluid flowing through an L-shaped cavity using different nanoparticles. The second law of thermodynamics has been applied to investigate the effect of Prandtl number on the average Nusselt number, total entropy generation and Bejan number using water and, Cu-water, Ag-water and Al2O3-water nanofluids. Isotherms, stream function and entropy generation caused by heat transfer are also presented as a function of Prandtl numbers for various nanoparticles. Using the penalty finite element method with Galerkin’s weighted residual, the governing equations are solved. Results show that Ag-water nanofluid with the highest Prandtl number gives the highest amount of irreversibility as well as rate of heat transfer. Cu-water and Ag-water nanofluid produce more irreversibilities than Al2O3-water nanofluid and base fluid. Also, Nusselt number and Bejan number increase with the increasing Prandtl number. Therefore, Prandtl number is a central parameter for desired heat transfer increment with decreasing entropy generation in the given geometry. | |