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Magnetic field effect on mixed convection in lid-driven trapezoidal cavities filled with a Cu-Water nanofluid with an aiding or opposing side wall
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Abstract
The present study investigates mixed convection inside a Cu-water nanofluid filled trapezoidal cavity under the effect of a constant magnetic field. The mixed convection is achieved by the action of lid-driving of the right hot inclined side wall in the aiding or the opposing direction. The left inclined side wall is fixed and kept isothermal at a cold temperature. The horizontal top and bottom walls are fixed and thermally insulated. The magnetic field is imposed horizontally. The problem is formulated using the stream function-vorticity procedure and solved numerically using an efficient upwind finitedifference method. The studied parameters are: the Richardson number Ri=(0.01-10), the Hartman number Ha=(0-100), the volume fraction of Cu nanoparticles φ=(0-0.05), and the inclination angle of side walls Φ=(66 deg, 70 deg, 80 deg). The results have shown that the suppression effect of the magnetic field for the aiding case is greater than that for the opposing case. Meanwhile, the enhancement of the Nusselt number due to the presence of the Cu nanoparticles is greater for opposing lid-driven case. © 2016 by ASME.

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