

Comparison on Electrode and Ground Arrangements Effect on Heat Transfer under Electric Force in a Channel and a Cavity Flow

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Abstract : This study numerically investigates the effects of Electrohydrodynamic on flow patterns and heat transfer enhancement within a cavity which is on the lower wall of channel. In this simulation, effects of using ground wire and ground plate on the flow patterns are compared. Moreover, the positions of electrode wire respecting with ground are tested in the range of angles $\theta = 0 - 180^\circ$. High electrical voltage exposes to air is 20 kV. Bulk mean velocity and temperature of inlet air are controlled at 0.1 m/s and 60°C, respectively. The result shows when electric field is applied, swirling flow is appeared in the channel. In addition, swirling flow patterns in the main flow of using ground plate are widely spreader than that of using ground wire. Moreover, direction of swirling flow also affects the flow pattern and heat transfer in a cavity. These cause the using ground wire to give the maximum temperature and heat transfer higher than using ground plate. Furthermore, when the angle is at $\theta = 60^\circ$, high shear flow effect is obtained. This results show high strength of swirling flow and effective heat transfer enhancement.

Keywords : swirling flow, heat transfer, electrohydrodynamic, numerical analysis

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