

RESEARCH OF THE THERMOSOLUTAL NATURAL CONVECTION IN REFLOW OVEN

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Abstract

This study attempts to simulate the phenomenon of thermosolutal natural convection in a horizontal double-opening divided square box with the reflow oven under various boundary conditions and heat offering by performing experiment and numerical methods. To analyze the effects of horizontal divided square box under different temperatures. The fixed buoyancy ratio (N value), the flow field displayed due to the arrangement of plate, the temperature of the liquid inside the box and the varieties of concentration are included as the objectives of this study. A square box made of copper and acrylic sheets with an aspect ratio of 0.5 is used as the experimental apparatus of this study; the horizontal divided plates are placed in the upper and bottom of the interior of the box, while the fluid inside the box will be given in different concentrations. A measuring analysis will be performed to examine the temperature, concentration and mass transmission rate of the current. Finally, the FLUENT (CFD software) will be adopted to conduct numerical simulation on prototype to demonstrate an experiment with temperature variation rate and analyze the errors as contained. To simplify the governing equation of flow filed, the overall coordinate system will be treated as 2D numerical simulation, while visualization will be used to discuss and analyze the physics and results as developed with an attempt to improve the design of reflow oven. The dimensionless parameters as discussed in this study include:

$Ar=0.5$, $Ap=0.33$, $Pr=7\sim 8$, $Sc=1700\sim 2500$, $N=7.53$, $Gr_t=8.16\times 10^5$, $Gr_m=6.15\times 10^6$

Key words: Heat-insulated plate, natural convection, doubled-opening ratio

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