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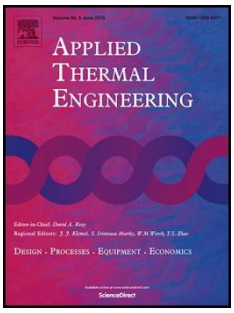

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Numerical simulation of mixed convection heat transfer of galvanized steel sheets in the vertical alloying furnace

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HIGHLIGHTS

- Galvanizing steel sheets in vertical alloying furnaces involves mixed convection.
- The alloying temperature can be controlled by Grashof number and Reynolds number.
- Increasing the Grashof number increases the temperature of the steel plate.
- Increasing the Reynolds number increases the temperature of the soaking zone.
- Increasing the Reynolds number reduces the temperature of the cooling tower.

ABSTRACT The local temperature in galvanized plates during heat treatment in vertical alloying furnaces is an important factor that influences the alloying quality. Herein we simulate the heat transfer of conjugate mixed convection and three-dimensional turbulence flow in the entire soaking zone and cooling tower of the vertical alloying furnace, using Reynolds-averaged Navier–Stokes and energy equations enclosed by k–ε two-equation turbulence model. The flow fields and temperature

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