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Doostani, A., Ghalambaz, M., Chamkha, A.J.

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Abstract
The present study aims to investigate the effect of the presence of a uniform magnetic field on the rate of melting and melting behavior of an electrically-conducting material in an enclosure. The left and right walls of the cavity are isothermal at hot and cold temperatures, respectively. The top and bottom walls are adiabatic. The phase-change process is formatted using the enthalpy-porosity model by considering a fixed computational grid. The governing equations are transformed into a non-dimensional form and then solved by the aid of the finite element method. The results of the present study are compared with the experimental and numerical data available in the literature and are found to be in good agreement. In order to investigate the effect of magnetic field on the melting process, the results of the present study are reported for various values of the Hartmann number in the range 0–100. The results show that increasing of the Hartmann number reduces the melting volume fraction and tends to suspend the convective mechanisms. However, high magnetic fields induce more uniform temperature gradients. Therefore, using a strong magnetic field can have a significant impact on the melting control process of electrically-conducting materials. © 2017, The Brazilian Society of Mechanical Sciences and Engineering.

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