Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Influence of mushy zone constant on the solid-liquid phase change process modeled by enthalpy-porosity technique SAEED TIARI, MAHBOOBE MAHDAVI, SONGGANG QIU, Department of Mechanical Engineering, Temple University, Philadelphia, PA — In the present work, the effects of mushy zone constant on the melting and solidification processes simulation with enthalpy-porosity technique are investigated. The isothermal melting and solidification of gallium enclosed by a rectangular container is studied using a transient two-dimensional finite volume based model. A wide range of mushy zone constants are considered in the study of the thermal and fluid flow characteristics of the system. The results indicate that increasing the mushy zone constant value up to a limit leads to the acceleration of the solidification process, while it decreases the melting rate. However, the further increase of the constant does not affect the phase change process in melting and solidification. It is found that the mushy zone constant has a significant influence on the temperature distribution adjacent to the melt front as well as the morphology of the solid-liquid interface. This is due to the effect of mushy zone constant on the flow in the mushy region and liquid layers nearby. The results also reveal that the increase of mushy zone constant results in the decrease of average wall heat flux in both melting and solidification processes.

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Date submitted: 31 Jul 2015 Electronic form version 1.4