Proceedings of CHT-17
ICHMT International Symposium on Advances in Computational Heat Transfer

May 28-June 1, 2017, Napoli, Italy

CHT-17-054

AN ENTHALPY METHOD FOR MELTING WITH SOLID BULK MOTION AND CONVECTION IN THE MELT

Yoram Kozak[*,§] and Gennady Ziskind[*]
[*]Dept. of Mechanical Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel.
[§]Corresponding author. Email: kozaky@post.bgu.ac.il

ABSTRACT

The present work deals with a novel enthalpy-method-based numerical model for simulating solid-liquid phase change processes that can be accompanied by solid bulk motion. This model involves a full solution of the conservation equations, namely, continuity, momentum and energy, and thus takes into account the effect of heat convection in the melt. It does not require the use of any arbitrary constants, like the "mushy zone parameter" in the enthalpy-porosity formulation. Moreover, it allows proper coupling between the solid bulk sinking motion and the flow in the melt. Thus, this model can be applied for close-contact melting (CCM) processes, where the solid bulk sinks and melts directly on a hot surface, and a thin-molten layer is formed between the solid and the surface. The model is implemented by using an original in-house MATLAB code, and discretized via the finite-difference method. The basic problem of CCM in an isothermal rectangular cavity is solved for demonstration purposes of the model capabilities. It is shown that the model can predict the basic physical processes accompanied by CCM.