1033-80-107   **Tim P. Schulze*** (`schulze@math.utk.edu`), Mathematics Department, 121 Ayres Hall, University of Tennessee, Knoxville, TN 37996-1300, and **M. Grae Worster**. *The mushy zone free boundary problem.*

Mushy zones are porous layers of dendritic crystals that commonly form during solidification of multi-component melts and are often modeled as a reactive porous medium representing a homogenized liquid–solid phase. We present governing equations and boundary conditions for the mushy zone free boundary problem that are valid in an arbitrary frame of reference. The model for time-evolving mushy zones is more complicated than the steady case because the interface velocity $\mathbf{w}$ can be distinct from both the velocity of the dendrites $\mathbf{v}$ and the fluid velocity $\mathbf{u}$. We consider the limit of negligible solutal diffusivity, where the boundary conditions at the mush–liquid interface come in four varieties, depending on both the direction of flow across the interface and the direction of the interface motion relative to the solid phase. We illustrate these boundary conditions by examining some simple one- and two-dimensional flows. (Received September 06, 2007)