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Convective Interactions and Heat Transfer in a Czochralski Melt with a Model Phase Boundary of Two Different Shapes

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Abstract : Implicit in most large-scale numerical analyses of the crystal growth from the melt is the assumption that the shape and position of the phase boundary are determined by the transport phenomena coupled strongly to the melt hydrodynamics. In the present numerical study, the interface shape-effect on the convective interactions in a Czochralski oxide melt is described. It was demonstrated that thermos-capillary flow affects inversely the phase boundaries of distinct shapes. The in homogenity of heat flux and the location of the stagnation point at the crystallization front were investigated. The forced convection effect on the point displacement at the boundary found to be much stronger for the flat plate interface compared to the cone-shaped one with and without the Marangoni flow.

Keywords : computer simulation, fluid flow, interface shape, thermos-capillary effect
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