FM21S_12687

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Convective Heat and Mass Transport in Novel Bridgman Configurations for Cadmium Zinc Telluride Growth

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We are studying the influences of convection on heat and mass transfer in vertical Bridgman (VB) systems used to grow cadmium zinc telluride (CZT), a ternary compound which is susceptible to constitutional supercooling. We have constructed transport models of two novel VB configurations. A top-seeded configuration has a destabilizing temperature gradient in the melt. The flows in this configuration are far more intense than occur in the stabilized bottom-seeded VB configuration. Better mixing reduces radial segregation for doped-semiconductor melts, results that we expect will extend to CZT melts. Interface shapes remain unfavorably concave, however. An alternative is a bottom-seeded VB system with submerged heater, which gives superior control of interface shape, but which has poor lateral mixing. This alternative requires active control to maintain a constant gap between the interface and the heater. We will compare these systems in terms of interface shape, morphological stability, segregation behavior, and thermal stresses.

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