

Numerical Study on Temperature and Flow Field in CZ-Crystal Growth System

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In this study the conjugate fluid flow and energy transport problem (involving conduction, convection, radiation heat transfer) resulting from Czochralski crystal growth process is analyzed. Convective phenomena in the melt play an important role in Czochralski crystal growth because they affect issues like crystal diameter control, the shape of the crystal-melt interface and the occurrence of dopants (impurities) inhomogeneities which determine the quality of product.

Physical mechanism driving convective flows includes buoyancy-driven convection, forced convection (due to rotation of crucible, crystal) and thermocapillary (Marangoni) convection. Also, argon gas entered as a protective environment gives effect to melt convection when its shear stress increase at melt/gas interface. According to intensities of these effects, melt flow patterns are investigated.