Simulation of BGO single crystal growth by improved low thermal gradient (LTG) Czochralski

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Abstract

In this paper, the temperature field and flows during different stages of low thermal gradient (LTG) Czochralski single crystal growth and using the resistive heating system have been simulated and the quality of grown crystal has been investigated using the thermal stress at different heights. The configuration of the used growth furnace in this system is in accordance with a real system in the lab and consists of a cylindrical ceramic tube, a heat shield and three element heat zones with different radii to generate and control the low temperature gradient. The surface to surface and internal radiation heat transfer has been considered in the system. The results of simulation and its adaptation to the experimental data show that the low temperature gradient and specific configuration of the system lead to optimization of the crystal-melt interface, the reduction of thermal stresses and the improvement of the quality of the crystal grown.

Keywords: Computer simulation, Heat transfer, Fluid flows, Czochralski method, Single crystal

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