

TAILORED MAGNETIC FIELDS FOR CONTROLLED SEMICONDUCTOR GROWTH

Baskar Ganapathysubramanian and Nicholas Zabaras
Materials Process Design and Control Laboratory
Sibley School of Mechanical and Aerospace Engineering
188 Frank H. T. Rhodes Hall
Cornell University
Ithaca, NY 14853-3801
bg74@cornell.edu, zabaras@cornell.edu

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The application of a time varying magnetic has been shown to affect the properties of the semiconductor single crystal achieved through growth from the melt [1,2]. The application of a time dependent rotation of the crucible affects the flow pattern in the melt resulting in enhanced distribution of thermal effects. We will investigate the three dimensional coupled effects of an externally applied magnetic field and a time varying rotation imposed on the solidifying melt. The relative effects of each factor on the shape of the interface will be quantified. This will provide a means of relating the pulling velocity and the imposed thermal gradients along these two control parameters on the process history and the quality of the solid. A three dimensional optimization problem will then be posed to design the temporal variation of the magnetic field and/or the rate of rotation to achieve certain goals. These goals include maximizing the pulling rate, minimizing the thermal gradient imposed, as well as controlling the shape of the melt-solid interface.

References

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