

ANALYTICAL SOLUTION OF THE ANGULAR VELOCITY IN THE CZOCHRALSKI CRYSTAL GROWTH PROCESS

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Abstract:

The Czochralski crystal growth manufacturing process results in small periodic and undesirable undulations in the crystal diameter under certain conditions. These oscillations have strongly nonlinear characteristics. There appear to be critical values for certain parameters, such as the rotational velocity, which govern the appearance or non-appearance of these undulations. This paper uses perturbation theory to facilitate analyzing and explaining the fluctuations occurring in the Czochralski process by deriving analytical solution to the rotational velocity equation. The fluctuations were analyzed by the perturbation theory, applied to the non-linear governing equations. A rigorous analytic solution of the equations for the linearized rotational fluid velocity was performed, using mode-matching.

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