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Modeling and Characterization of the SiC Single Crystal Growth Process

Authors : T. Wejrzanowski, M. Grybczuk, E. Tymicki, K. J. Kurzydlowski

Abstract : In the present study numerical simulations silicon carbide single crystal growth process in Physical Vapor Transport reactor are addressed. Silicon Carbide is a perspective material for many applications in modern electronics. One of the main challenges for wider applications of SiC is high price of high quality mono crystals. Improvement of silicon carbide manufacturing process has a significant influence on the product price. Better understanding of crystal growth allows for optimization of the process, and it can be achieved by numerical simulations. In this work Virtual Reactor software was used to simulate the process. Predicted geometrical properties of the final product and information about phenomena occurring inside process reactor were obtained. The latter is especially valuable because reactor chamber is inaccessible during the process due to high temperature inside the reactor (over 2000˚C). Obtained data was used for improvement of the process and reactor geometry. Resultant crystal quality was also predicted basing on crystallization front shape evolution and threading dislocation paths. Obtained results were confronted with experimental data and the results are in good agreement.

Keywords : Finite Volume Method, semiconductors, Physical Vapor Transport, silicon carbide
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