

Finite Volume Method Simulations of GaN Growth Process in MOVPE Reactor

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Abstract : In the present study, numerical simulations of heat and mass transfer during gallium nitride growth process in Metal Organic Vapor Phase Epitaxy reactor AIX-200/4RF-S is addressed. Existing knowledge about phenomena occurring in the MOVPE process allows to produce high quality nitride based semiconductors. However, process parameters of MOVPE reactors can vary in certain ranges. Main goal of this study is optimization of the process and improvement of the quality of obtained crystal. In order to investigate this subject a series of computer simulations have been performed. Numerical simulations of heat and mass transfer in GaN epitaxial growth process have been performed to determine growth rate for various mass flow rates and pressures of reagents. According to the fact that it's impossible to determine experimentally the exact distribution of heat and mass transfer inside the reactor during the process, modeling is the only solution to understand the process precisely. Main heat transfer mechanisms during MOVPE process are convection and radiation. Correlation of modeling results with the experiment allows to determine optimal process parameters for obtaining crystals of highest quality.

Keywords : Finite Volume Method, semiconductors, epitaxial growth, metalorganic vapor phase epitaxy, gallium nitride

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