

Numerical Design and Characterization of MOVPE Grown Nitride Based Semiconductors

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Abstract : In the present study numerical simulations of epitaxial growth of gallium nitride in Metal Organic Vapor Phase Epitaxy reactor AIX-200/4RF-S are addressed. The aim of this study was to design the optimal fluid flow and thermal conditions for obtaining the most homogeneous product. Since there are many agents influencing reactions on the crystal growth area such as temperature, pressure, gas flow or reactor geometry, it is difficult to design optimal process. Variations of process pressure and hydrogen mass flow rates have been considered. According to the fact that it's impossible to determine experimentally the exact distribution of heat and mass transfer inside the reactor during crystal growth, detailed 3D modeling has been used to get an insight of the process conditions. Numerical simulations allow to understand the epitaxial process by calculation of heat and mass transfer distribution during growth of gallium nitride. Including chemical reactions in the numerical model allows to calculate the growth rate of the substrate. The present approach has been applied to enhance the performance of AIX-200/4RF-S reactor.

Keywords : computational fluid dynamics, finite volume method, epitaxial growth, gallium nitride

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